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The Optics of Sound Recording Systems

By ARTHUR C. HARDY

Associate Professor of Optics and Photography, Massachusetts Institute of Technology, Cambridge, Mass.
Read at the Fall Convention of the S. M. P. E., 1928. Held at Lake Placid, New York.

(Continued from January Cinematographer)

Recording with a Kerr Cell

In the systems that have just been considered, the

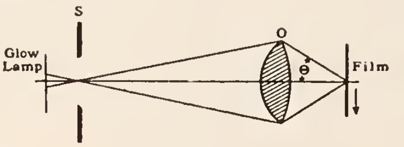


Fig. 4

brightness of the light source was modulated by introducing the amplified sound current into its supply circuit. Unfortunately there are only a few discharge tubes which will follow the rapid changes in sound intensity and the brightness of these sources is usually low. Until glow lamps of higher intrinsic brightness are developed, it will be necessary to use other sources of light for high quality recording since the amount of light available with the best of glow lamps at the present time is barely sufficient to expose cine negative film. The low resolving power and bad graininess of this material make it undesirable for sound recording purposes, and, as the desirable pho-

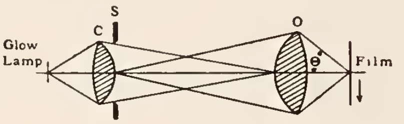


Fig. 5

tographic characteristics are obtainable only at the sacrifice of sensitivity, it is customary to use a light of higher brightness with some sort of modulating device or light valve. The simplest of these is the well-known Kerr cell.

The Kerr cell consists of a pair of electrodes in a liquid such as trinitrobenzene which has the property of becoming doubly refracting in an electrostatic field. A

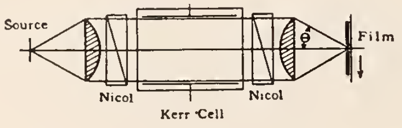


Fig. 6

Diagram of the Kerr cell recorder.

sound recording system using such a cell is shown in Fig. 6. Light from any source of constant brightness, such as the filament of an incandescent lamp, passes through the collimating lens and then through a polarizing Nicol prism before entering the Kerr cell. On leaving the cell the light passes again through a Nicol prism and a lens which forms an image of the filament source on the slit in front of the film. The second Nicol prism is so adjusted with respect to the first that when no voltage is applied to the electrodes of the cell they transmit one quarter of the incident light. When the signal voltage is applied to the cell, the exposure of the film is increased or decreased in a manner which corresponds roughly to the original variations in sound intensity.

4 Since the numerical aperture of a microscope objective is usually known, it is frequently more convenient to use equation 4 instead of equation 6. The numerical aperture of a microscope objective used in air is equal to the sine of the angle θ when the objective is used at the magnification for which it was designed. As the objective shown in Fig. 4 is used for reduction rather than for magnification, the sine of the angle θ is equal to the indicated numerical aperture when the distance from S to O is roughly 160 mm. The sine of θ varies inversely as the magnification plus one. Consequently, when the magnification is less than 1, as in Fig. 4, the illumination depends very little upon the magnification. For high values of the magnification it is nearly inversely proportional to the square of the magnification.

5 This assumes the use of a glow lamp of the same brightness and the same effective slit at the same magnification in both cases as explained in the last footnote.

It is obvious that the optical system of Fig. 6 is fundamentally the same as that shown in Fig. 2 provided that the Nicol prisms and Kerr cell are of sufficient size. In other words if the second lens is the aperture stop, as Fig. 6 shows, the angle θ may be made sensibly the same as in the case shown in Fig. 4. Although the normal setting of the Nicol prisms decreases the average illumination to one quarter of the amount available without them, the brightness of the filament of an incandescent lamp is many times greater than the brightness of any glow lamp having a reasonable life. Consequently, recording may be done with the Kerr cell arrangement on a less sensitive and better adapted type of photographic material.

Recording with a Strina Galvanometer: String Vertical

Of the mechanical devices which might be used for light valves, the simplest is undoubtedly the string galvanometer. This consists of a wire or ribbon called the string, suspended in a strong magnetic field. The passage of current through this string causes a deflection which may be made to open or close a suitable aperture. The string is normally adjusted to fill half of the opening when it carries no current. Then when a signal is impressed on the galvanometer. the resulting oscillations of the string cause corresponding variations in light flux which may be used for photographic recording. Ordinarily the film travels in a vertical plane so that the recording slit is horizontal. The string can be placed either vertically (across the slit) or horizontally (parallel to it).

Sound records of the variable width type can be made with the string vertical, but the illumination is so low that such a procedure is not practical. To secure good quality, the natural period of the string must be less than that of the highest pitch to be recorded. This means that the string must be light and consequently incapable of large deflections. In practice it is difficult to obtain deflections greater than 0.001 inch in a galvanometer having a satisfactory frequency response curve. As this deflection must be magnified nearly 100 times to fill a sound track of the usual width, the available illumination is necessarily low (see footnote 4).

By means of a suitable system of cylindrical lenses, the magnification between the string and the film may be 100 to 1 in the horizontal plane and 1 to 1 or better in the vertical plane. In the Kerr cell arrangement of Fig. 6 the magnification between the source and the film was 1 to 1 in both planes. Consequently, neglecting for the moment the absorption of light by the Kerr cell and the loss caused by the Nicol prisms, this type of string galvanometer arrangement can be only 1/100 as efficient in light-gathering power as the Kerr cell arrangement. If we continue to neglect the absorption in the cell but remember that the Nicol prisms reduce the illumination to one quarter of the value it would have otherwise, we find that the Kerr cell is some 25 times better than a string galvanometer used in this manner.

Fig. 7 shows a method of using a string galvanometer with the string vertical to produce a variable density type of record. The upper diagram represents a plan or horizontal view of the system and the lower diagram a vertical elevation. The source of light is focused by means

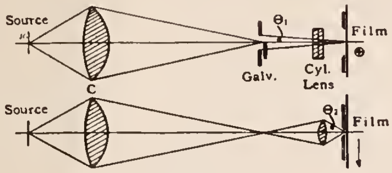


Fig 7

Method of using vertical string galvanometer for making variable density type of record.

of the condensing lens C on the ribbon of the galvanometer. The galvanometer is imaged on the film in the vertical plane by means of a cylindrical lens. Consequently, the solid angle of the cone of light (or pyramid of light in this case) reaching the film is the product of the angles Θ_1 and Θ_2.

It is obvious that the value of Θ may be made approximately as great as the angle Θ in the Kerr cell arrangement of Fig. 6. The maximum value of Θ_1 requires a little more careful consideration. If no mechanical difficulties were encountered, the galvanometer should be placed as close to the film as possible, the limit being reached when the opening subtends the same angle from the film as the lens C. In other words, except for mechanical limitations Θ_1 may approach the value of Θ_2 in a well-designed system.

If, as usually happens, the magnets of the galvanometer prevent it from being placed as close to the film as desired, the string can be imaged at the proper point by means of a cylindrical lens inserted in the upper diagram. Since the opening in the galvanometer, however, is already as bright as the source and since it is impossible to increase this brightness by any optical system, the limit of light-gathering power of the latter system is the same as the case just considered. Consequently we may sum up the consideration of the vertical string type of string galvanometer with the statement that by properly designing the optical system it may be used to produce records of the variable-density type but is quite useless for the production of records of the variable-width type.

Recording with a String Galvanometer: String Horizontal

We have already seen that the deflection obtained with a string galvanometer suitable for recording high frequencies are small, usually of the order of 0.001 inch or less. Since the width of the slit is of this order of magnitude, it is possible to make sound records of the variable-density type by means of the system shown in Fig.

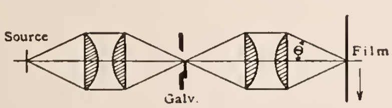


Fig 8

Method of using horizontal string galvanometer for producing variable density record.

8. The source of light is focused on the film. Each of the four lenses shown may conveniently be a microscope objective of 66 mm. focal length and 0.25 numerical aperture. Since the magnification of the source of light on the film is approximately unity, the illumination is four times as intense as that produced by the same objectives used in the Kerr cell arrangements of Fig. 6 because of the loss occasioned by the Nicol prisms. The sound produced by this system is slightly distorted in the high frequencies, when the velocity of the string approaches that of the film. Since the effect of distortion, however, is to introduce higher harmonics, it may not be serious because of their relative inaudibility. This arrangement is as satisfactory as any for the production of sound records of the variable-density type. Records of the variable-width type are difficult to produce with a horizontal string galvanometer.

Recording with an Oscillograph: Variable Density Records

In the string galvanometer method of recording, a mechanical part such as a wire or ribbon is used as the movable portion of the light valve. Instead of utilizing an actual motion of this sort the equivalent effect may be produced by causing the image of some stationary aperture to move with respect to some other stationary aperture. This can be done most conveniently by the use of an oscillograph mirror.

The oscillograph consists essentially of two parallel wires stretched taut in a magnetic field. These wires are so connected together that the current flows upwards, say, in the one at the same time that it flows downwards in the other. A small mirror is attached by its edges to these wires in such a manner that a current causes a rotation of the mirror, usually about a vertical axis.

The optical system of the oscillograph has been made the subject of a previous investigation.[6] Fig. 9 shows an adaptation of this instrument to the production of sound records of the variable-density type. The source

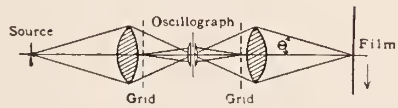


Fig. 9

Arrangement used with oscillograph for producing variable density records.

of light is focused on the oscillograph mirror which in turn is refocused on the film, Fig. 9 being a horizontal or plan view of the optical system. This figure has been drawn as though the mirror produced no deflection of the beam, but acted only as a stop or aperture in the system. In any actual case, of course, the light should fall as nearly perpendicularly on the mirror as possible and should be reflected in the same manner. At each of the objectives is placed a grid consisting of parallel wires or ribbons with alternate transparent spaces. At the oscillograph mirror is a single lens which images the first grid on the second. Since light traverses this lens twice, the effect is the same as if there were two lenses, and Fig. 9 has been so drawn.

Before a program is recorded, the mirror is so adjusted that when no signal is impressed on the oscillograph, the image of the wires of the first grid half covers the spaces of the second grid. The grid should be so designed that the maximum deflection of which the mirror is capable will produce a shift of the image equal to one-half of the width of the spaces. Consequently, when a signal is impressed on the oscillograph, the amount of illumination at the film varies in accordance with the sound pressure at the microphone. This system has been shown with a close-up slit but it may be modified for use with an imaged slit as in Fig. 4.

In practice, the width of the mirror in a suitable oscillograph is rarely more than 0.5 mm. Since this mirror is imaged on the film, it must obviously be magnified at least six times in order to cover a sound track 3 mm. wide. Since the illumination in the image is about inversely proportional to the square of the magnification plus one (see footnote 4), it follows that in this case the illumination can be only 1/12 as intense as with the unit magnification of the system shown in Fig. 8. This may be partially remedied by inserting a cylindrical lens with its axis perpendicular to the plane of Fig. 9. This is usually possible because the height of the oscillograph mirror is greater than the width of the recording slit so that unit magnification or less can be used in this plane. If we assume the magnification in the vertical plane to be unity and the magnification in the horizontal plane to be 6, the light-gathering power with this arrangement is roughly two-sevenths as great as with the system of Fig. 8.

Recording with an Oscillograph: Variable Width Records

The difficulty of producing high quality sound records of the variable-density type has already been emphasized in a previous paper,[7] where it was shown that the characteristics of photographic materials are such that improper

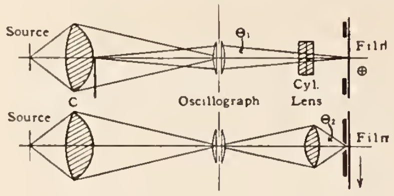


Fig. 10

Optical system for making variable width sound record with an oscillograph.

exposure or development will introduce distortion. This source of distortion can be eliminated by the use of sufficient care in the photographic phase of the problem, but it is doubtful whether this is justified at the present time. The variable width type of record is inherently free from this type of distortion and is easily produced by an optical system such as that shown in Fig. 10.

In this arrangement the source of light is focused on the oscillograph mirror by means of a spherical lens. As before, the mirror is drawn as though it produced no deflection of the beam. In the vertical plane, shown in the lower diagram, the mirror is refocused on the close-up slit by means of a cylindrical lens. In the horizontal plane the beam is allowed to diverge and cover the width of the sound track. A stop at the condensing lens C covers half of the area of the lens. This stop is reimaged on the film by means of the single lens close to the mirror, this lens being again shown double in the diagram since the light traverses it twice. The neutral position of the mirror is adjusted so that the image of the edge of the diaphragm at lens C occupies the center of the sound track. As the signal is impressed on the oscillograph, the image of the diaphragm moves from side to side and produces records of the well-known variable width type.

Since the light-gathering properties of the oscillograph have already been discussed at some length in the previous paper,[6] it is only necessary to refer here briefly to the general conclusions. As in the previous case, shown in Fig. 7, the illumination is proportional to the product of the angles Θ_1 and Θ_2. The angle Θ_2 may have a value equal to that of Θ_2, in Fig 7. On the other hand, the value of Θ_1 depends on the distance from the mirror to the film which, in turn, depends on the sensitivity of the oscillograph vibrator. It is usually possible to obtain a deflection of one inch at a distance of ten inches without heating the vibrator enough to give it an undesirable frequency response. With a sound track 0.1 inch in width, therefore, the proper place for the mirror is one inch from the film. If it is placed closer than this, the full width of the sound track will not be utilized without overloading the vibrator. If it is placed at a greater distance, Θ_1, the illumination will be reduced proportionately.

It is frequently impracticable to place the vibrator as close to the film as required by the optical considerations. In such cases, as we have seen before, the mirror may be imaged at the proper point, perferably by means of a cylindrical lens inserted in the upper diagram. Such a lens, however, is powerless to increase the illumination over that provided by the scheme shown in Fig. 10.

6 "The Optical System of the Oscillograph and Similar Recording Instruments," by A. C. Hardy, J.O.S.A., R.S.I., 14, June, 1927, p. 505.

7 "The Rendering of Tone Values in the Photographic Recording of Sound," by A. C. Hardy, Trans. Soc. M. P. Eng., Vol. XI, No. 31, p. 475, (1927).

With a mirror 0.5 mm. in width and 25 mm. from the film, the numerical aperture in the upper diagram is only 0.01. Since this system, however, requires no modulation control with its attendant reduction in exposure it is very satisfactory for recording even on cine positive film.

This system has been considered with reference to the close-up slit arrangement only. From previous considerations, however, it is obvious that the slit could be imaged on the film, and it is likewise apparent that such a procedure is justified only as a matter of convenience from the mechanical standpoint rather than from any superior light-gathering characteristics of the imaged slit system.

Reproducing

We have already found that the illumination of the reproducing slit should be 200 lumens per square centimeter. This corresponds to the placing of a 200 candlepower lamp at a distance of 1 centimeter or the equiv-

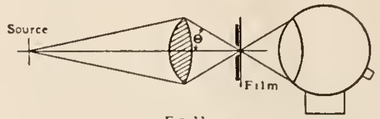


Fig 11

Diagram of optical system of photoelectric cell reproducer.

alent. The design of incandescent lamps is such that the bulb usually prevents placing the filament sufficiently close to the reproducing slit. As a consequence, it is customary to employ an optical system similar to that shown in Fig. 11. The filament is here imaged on the reproducing slit and the illumination may be calculated by means of equation **4**. Since the brightness of the average tungsten filament operated in such a way as to insure a reasonable life is of the order of 1200 candles per square centimeter, a microscope objective of 0.25 numerical aperture will produce an illumination at the slit of 235 lumens per square centimeter. As we have already seen, this will provide an average photoelectric cell current of about a microampere.

The objections to a close-up slit apply even more forcibly in reproducing than in recording. Consequently it is preferable to use the system shown in Fig. 12, wherein

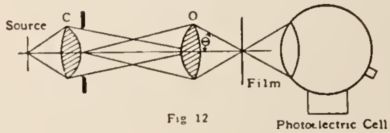


Fig 12

Diagram of reproducer optical system with close-up slit eliminated.

the filament is imaged on the microscope objective O by a condensing lens C and a slit of generous dimensions is imaged on the film. If the objective O is filled with light, the flux reaching the photo-electric cell will be the same in this case as with the system shown in Fig. 11.

Conclusion

The declared purpose of this paper was to illustrate the general method of computing the amount of light which passes through any optical system. Although this general method has been freely illustrated by examples chosen from among the better known methods of sound recording, it is impossible to compare the merits of the various systems without assigning actual numerical values to the quantities involved. This is due to the fact that the amount of light available with most systems depends upon mechanical or electrical limitations rather than optical ones. For example, in the case of a string galvanometer the amount of exposure on the film with a properly designed optical system depends on the displacement which may be given to the string and its current capacity. It is hoped, therefore, that the numerical values herein presented for purposes of illustration will not be interpreted as a final comparison of the merits of the various systems of recording and reproducing. The question of image perfection has been entirely ignored in the present paper for lack of space.

Charles Stumar, A. S. C., writes from Arosa, Switzerland, that he is engaged in shooting Universal's first German production, directed by William Dieterk, and starring Lien Deyers. The title of the picture is "The Triumph of Life." Charlie will be absent several months.

A Multiple Synchronous Rewind

TECHNICAL EDITOR

[*Mr. Bergman writes the* CINEMATOGRAPHER *that anyone who may desire to do so is at liberty to copy, build or use this apparatus without obligation of any kind.*—EDITOR'S NOTE.]

Mr. H. W. Bergman, Sound Engineer of the Metropolitan Studios, has devised a multiple rewind which permits the rewinding of three picture films and their corresponding single sound film, while eliminating the possibility of incurring in any error of synchronization of the several records, and they matching to perfection any number of long shots, semi or close-ups pertaining to one single film with one single sound record.

The cutting of the negatives as well as the cutting and editing of the positive prints are extremely facilitated by this ingenious device and the AMERICAN CINEMATOGRAPHER" is grateful to Mr. Bergman for his authorization to make public the specifications for the construction of this very useful apparatus.

The following illustrations and brief outlines of its functioning are more eloquent than any drawn-out, lengthy description of the different parts of the apparatus and of the possibilities it presents.

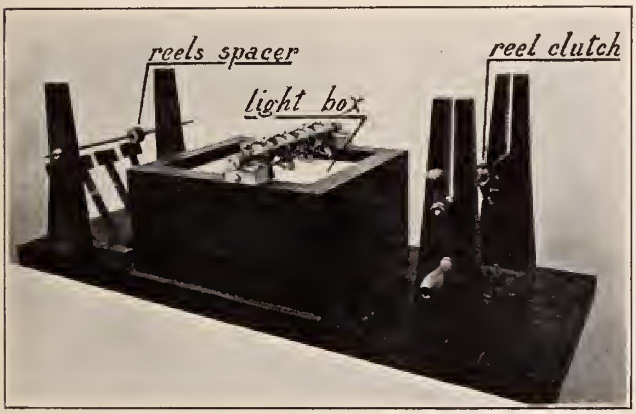


Fig. 1

As seen in the figure, the apparatus mainly consists of one bridge (left side) holding the reels to be rewound, a light-box, a train of carrying sprockets and finally a bridge which holds the reels during rewinding.

First—The supplementary parts of the first bridge are: As many light spring brakes as reels which may be set in position of rewinding. The mission of these brakes is to avoid an unduly rapid unwinding of the film, and

Second—As many reel spacers as necessary to keep the reels and consequently the film, in alignment with the sprockets.

The light-box is of the usual type containing a sufficient number of incandescent light bulbs to transmit a sufficient and even illumination through its opalescent cover.

Figure 2 shows in detail the top of the light-box and the train of sprockets. The four carrying sprockets are fastened to a common axle free to rotate on ball-bearing. **Frame-marks** are engraved on each sprocket and set in perfect alignment.

The punch or fogging marks impressed upon the picture and sound films, permit the perfect alignment of the different records (different picture records pertaining to one single sound record), and in course of rewinding, unwinding and inspection the different records are kept in constant alignment and in perfect synchronization.

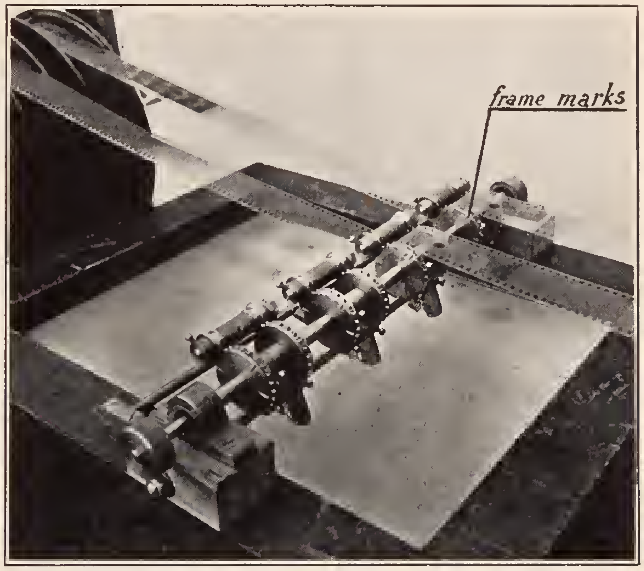


Fig. 2

The pressure of the rollers which hold the film in position on the sprockets is controlled by springs, one end of which is fastened, as shown in the figure, to a stationary rod, while the other end is fastened to a lever which is an intrinsic part of the roller itself.

In the more recent models of the apparatus a driving wheel and handle has been attached to the axle supporting the sprockets at the end nearer the operator, so as to

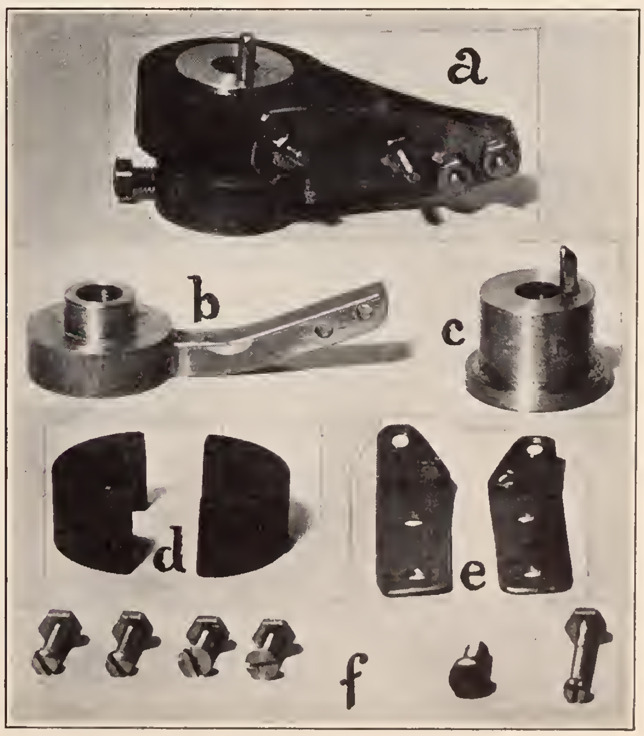


Fig. 3

permit him to unwind and rewind small lengths of film for close inspection.

Referring again to Fig. 1 it will be noticed that a supplementary part of the rewinding bridge, besides the usual handle, is a reel clutch fastened to the axle holding the rewinding reels.

This clutch is, in fact, the most essential part of the whole apparatus. Its function is to maintain a constant tension on the film which is being rewound, irrespective of the size of the film roll.

The clutch also serves to keep the constant separation between reels on the take-up bridge.

Fig. 3 gives a view of the assembled clutch and of its component parts:

(a) Shows the clutch.

(b) Its central core which is held fast to the axle of the rewind by means of a set screw.

(c) A free knob which becomes part of the reel itself when the fixed pin is inserted in the slot of the reel commonly used to hold the reel in any rewinding apparatus.

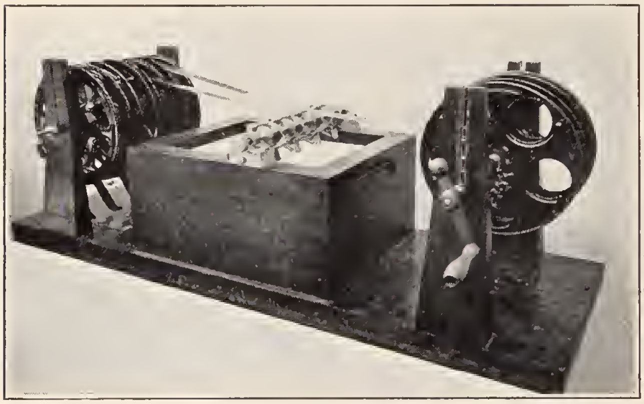


Fig. 4

(d) A split fiber ring.

(e) Two springs fastened at one end to the central core and at the other end to the split fiber ring.

(f) The set of screws necessary to hold the clutch together.

The functioning of the clutch is quite easy to understand. By turning the handle, an impulse is simultaneously given to the rewinding reels, making them turn at a uniform speed.

If one of the reels is holding more film than another, its revolution should be slower in order to keep the frames of the picture to be synchronized in their proper position on the driving sprockets. In such case the fiber ring and springs act as a brake on the free knob, thus reducing the revolving speed of the reel, while the central core makes as many revolutions as there are imparted to the handle and axle.

Fig. 4 presents the rewind complete with reels and two films in position. The four clutches are easily distinguishable.

Once the films are set in the apparatus according to their starting mark, they may be wound and unwound at will without altering the synchronizing position.

Needless to say that the number of driving sprockets is not limited to the four shown in the figures, but can be increased at will. This ingenious apparatus has proven very useful and practical and all film editors and cutters will undoubtedly welcome its appearance.

"Cine-Art News"

"Cine-Art Amateur Movie News," Vol 1, No. 7, is a new Hollywood publication of eight pages devoted to amateur motion picture cinematography and matters appertaining thereto. It is a newsy and skilfully edited periodical and appears to be on the way to a successful career. THE AMERICAN CINEMATOGRAPHER welcomes the newcomer and wishes it a career of great usewulness and prosperity. The **"Cine-Art News"** is distributed by Cine-Art Productions, 6060 Sunset Boulevard, Hollywood.

Hail and Farewell

In the following resolution the Board of Governors of the A. S. C. expressed the sentiments of the Society toward Mr. Joseph A. Dubray, until recently secretary of the A. S. C., who has gone to Chicago to assume the duties of director of technical service with the Bell & Howell Company. The gain of Bell & Howell and Chicago is the loss of Hollywood and the motion picture industry, but THE AMERICAN CINEMATOGRAPHER is happy to note that Mr. Dubray still retains his position as technical editor of the A. S. C. magazine and will be a frequent contributor to its columns. The A. S. C. resolution follows:

J. A. Dubray

A Resolution

WHEREAS, Our brother, Joseph Dubray, has tendered his resignation to the Board of Governors as secretary of the American Society of Cinematographers in order to assume duties in a new field of endeavor far removed from the permanent seat of this Society, be it

RESOLVED: That the A. S. C. accepts Mr. Dubray's resignation with the greatest regret, recognizing as it does his loyal, unselfish and efficient service to this Society and to the motion picture industry in general. A veteran camera master and technical expert in the science of photography, our retiring secretary has ever given freely of his knowledge and skill and has, because of his versatile talents, reflected great honor upon both the A. S. C. and himself.

The A. S. C. therefore, by this resolution, goes on record as placing the stamp of unqualified approval upon our departing brother, recommends him without reserve to his new employers and bespeaks for him unqualified success and boundless prosperity and happiness in his new field.

American Sound-Films on German Device-Tobis Claims For Interchangeability

[*The American Cinematographer has just received this brief announcement from the general secretary of Tobis, the Tonbild-Syndikat, Berlin, Germany. It is evident that America is not alone in sound research as it is related to the cinema.—Editor's Note.*]

Last week the German Tonbild Syndikat Company (Tobis) gave in a Berlin West-end theatre a private demonstration to a number of known cinema experts to show the first time its new unified reproducing device for sound films. This does not need a special projector but consists in a very small and simple attachment which can be installed in a few hours in addition to any usual German cinema-projector, together with amplifiers and loud-speakers specially designed by Tobis, providing an excellent reproduction of speech, music, effects, etc.

The Tobis-device is running usual film of normal width, bearing the sound track inside the sprocket-holes and claims for interchangeability with any English or American sound-on-film system, such as Movietone, Photophone, Cinephone, Phonofilm and so on.

In order to prove that fact, the Tobis company showed, after a number of their own recently-produced sound subjects, three reels of American film, which were reproduced quite clearly.

Tobis is now wiring five big houses in Berlin, Hamburg, Düsseldorf, Leipzig and Munich at a price of a tenth of the Western Electric system, and will continue the installations from February at a rate of fifty sets per month.

A Camera for Making Parallax Panoramagrams

By HERBERT E. IVES

Reprinted by special permission of Dr. Ives from the Journal of the Optical Society of America.

The name "Parallax Stereogram" was used by Frederic E. Ives to describe the stereoscopic transparency pictures invented by him,[1] in which the two component pictures were present as alternating fine strips, each series of strips visible to a single eye through a grating standing at an appropriate distance in front of the composite picture. The term "Parallax Panoramagram," I use to describe an analogous type of transparency picture, due to C. W. Kanolt,[2] in which in place of two pictures in strip form behind each clear grating space, there is an infinite series of strips, or a **panorama.** As the transparency, with its attached grating, is viewed from different angles, by a single eye, the picture seen through the grating spaces changes continuously, in the same manner that the originally photographed scene would change.

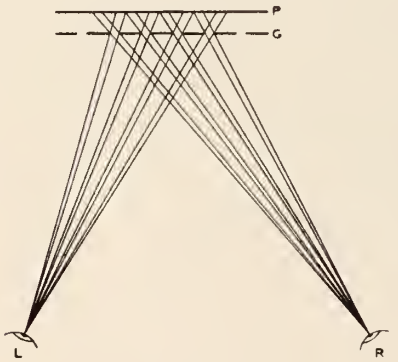


Fig. 1.

Viewed by both eyes a "panoramagram" presents stereoscopic relief, and, unlike the parallax stereogram, which must be held at a definite distance and angle, the panoramagram shows a relief picture at all distances, and at any angle. The purpose of this note is to describe a form of camera for making these pictures; and to record some observations on the results obtained with it.

The problems presented in the design of a camera for this purpose are most easily understood if the characteristics of the final positive picture are described. Consider first the parallax stereogram, as shown in diagrammatic section in Fig. 1. Here R and L represent the two eyes; G, the opaque line grating, in which the clear spaces are approximately half the width of the transparent; P, the positive picture, some distance behind G, and consisting of alternating strips of the right and left eye elements of the stereoscopic pair. A camera for taking the original negative can, quite obviously, be constructed by reversing the light paths, using two lenses, proper care being taken to invert the images, as for instance by the use of roof prisms. Consider next the panoramagram, shown in section in Fig. 2. Here, as before, R and L represent the two eyes, P the positive and G the grating, which is now, however, ruled with a high ratio of opaque to clear space, in order that a small motion of the eyes will expose a new series of infinitesimal strips. At R′ and L′ are shown two new positions of the eyes, at which they each see new views, again forming a stereoscopic pair. If the clear spaces in the grating are narrow enough, and the transparency picture has been properly made in the first place, it is obvious that the eyes may be placed in any position in front of the grating (within limits to be discussed later) and a stereoscopic picture will be seen.

Where the parallax stereogram is made with a pair of lenses the panoramagram is to be made with an infinite number of lenses, or, what amounts to the same thing, **a single lens continuously moved laterally during the exposure.** There are, however, several optical and photographic problems to be gotten around before the apparently simple operation of moving a lens across in front of a grating and plate will yield the kind of negative required. These may be listed as follows: (a) the inversion of the image by the photographic lens, (b) the partial inversion of the image by the photographic printing process, (c) the problem of positioning the image with respect to the plane of the grating, i.e., making an object appear in front of or behind the frame of the picture, (d) the operation of focussing the apparatus after it has been arranged to take care of the other requirements.

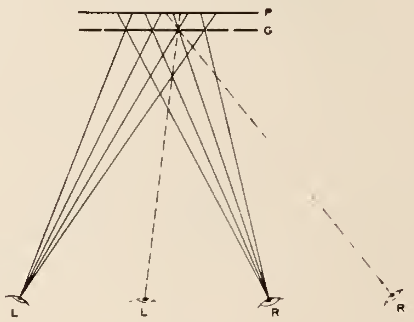


Fig. 2.

Without entering into a discussion of several alternative means by which the several requirements might be met,[3] we may examine at once the final design of camera as worked out, in which all the problems listed above are solved in a comparatively simple way. This is shown in Fig. 3 in a simplified diagrammatic form. The essential feature is that the object (O), the lens (L) and the

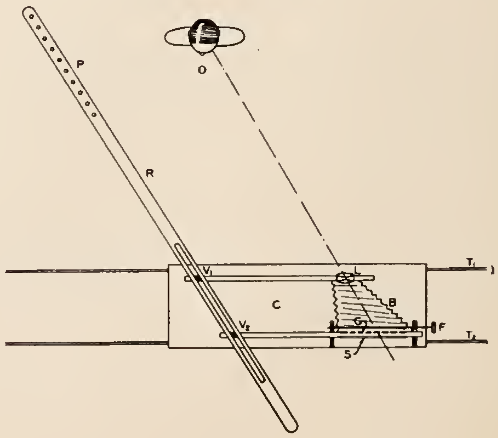


Fig. 3.

sensitive plate and grating (S and G), the latter rigidly clamped together (with a thin separator) as a unit in a special plate holder, are kept in line with each other as the lens and plate holder are moved laterally. The requisite motion is produced by having the lens and plate holder move along a track (T_1T_2) with their relative positions governed by a rod pivoted at the object which is to appear in the plane of the final picture. For obvious reasons of convenience the rod R is pivoted not at the object, but to one side (at P) and the pins (V_1 and V_2), which, sliding in a groove in the rod R, govern the lateral motion of the lens and plate holder, are carried out to the side of the camera body. The camera back, in which the plate holder is inserted, is mounted rigidly as to lateral motion on the carriage C, but is free to move forward and back by the rack and pinion F for focussing purposes, while the lens board is free to move only laterally on the carriage C. A bellows B connects the lens board and camera back.

The operation of the camera is as follows: With the lens at the middle of the track the pivot P is set opposite the portion of the object which is to be in the plane of the final picture, for instance the eyes, if a portrait is to be made. The camera is focused in this position by the rack and pinion F. The carriage C is then moved to one end of the track; the plate holder, containing grating, separator and plate is inserted, the slide drawn, and the carriage set in motion by means of a motor and cog wheel drive (not shown in the figure). As the carriage travels along, the lens moves from one side of the normal to the plate to the other, always keeping on the line between object and plate. When the carriage has reached the other end of the track the lens is capped, the plate removed and developed.

Positive prints made from the negatives produced by this camera are right side up and right way around when viewed through a grating like that used in taking. When the same separator is used between grating and positive as between grating and sensitive plate, and the viewing distance is the distance between taking lens and plate, the picture appears in correct relief at all angles of viewing.

Parallax panoramagrams as made in this way are very striking objects; they have, however, one characteristic limitation due to the finite size of the grating lines. In the experiments with this camera, which made pictures 5x7 inches, the grating had 50 lines to the inch and the ratio of opaque to clear spaces was 10:1. With this size of clear grating lines the definition of objects much in front of or behind the picture plane was poor due to the inevitable overlapping of many images. Much finer clear spaces would have improved this (assuming spreading by diffraction would not have offset the expected finer definition) but at the expense of light, which is already at a premium with the grating used. While this defect is not serious in portraits if the plane of the eyes and mouth is well defined, it becomes so if such objects as machinery or furniture are photographed.

While theoretically the angle through which a panoramagram can be observed can be made as large as desired, it is limited practically in the camera here described by the angular field which the lens L can cover. In the experiments made with the camera the lens used covered approximately 90°. The thickness of the separator between plate and grating was accordingly made approximately half the distance between grating lines. With this arrangement the whole surface of the plate is exposed; the relief picture is visible through 90°, but beyond 45° to the normal the picture starts to repeat itself.

This type of picture will be recognized by students of stereoscopy as intermediate in character between the parallax stereogram and the complete relief picture suggested by Lippmann, consisting of many minute lenses, each forming its own complete image of the scene before the plate. In this latter kind of picture (which would be excessively difficult to realize practically) objects preserve their proper relief and proportion for all positions of the observer. In the panoramagram, while the picture is visible at all distances and angles, only objects in the picture plane preserve their shapes rigidly correct, since the angles subtended in the recticle direction as the viewing distance is changed are to the picture plane and not to the apparent position of the object. This, while a theoretical defect, is not nearly as serious as the loss of definition away from the picture plane, above noted.

I take pleasure in acknowledging my indebtedness to Mr. Carl Percy, for whom this camera was constructed, for leave to describe it at this time.

New York, N. Y.

September 6, 1928.

1 U. S. Patent 725,567; 1903.

2 U. S. Patent, 1,260,682; 1918.

See also, G. Bessiere, Comptes Rendus, 182, p. 208; 1926.

3 Kanolt and Bessiere describe forms of cameras (loc. cit.). Kanolt moves the sensitive plate with respect to the grating, with which it is in contact, while the whole camera pivots around the object. Bessiere moves the lens, which is provided with a reversing prism, from the normal to one edge of the plate, across the plate, moving the whole camera as well to increase its range. Bessiere's arrangement is fundamentally bettered if a roof prism is used instead of a reversing prism since the lens can then be moved equally far to either side of the normal and the picture is obtained unreversed. Neither of the cameras is in my opinion as elegant or flexible as the one here described.

"Pocket-Size Talkie"

Recently Universal Service carried the following special telegram from New York: Demonstration of an entirely new method of synchronizing sound with motion pictures, using an opaque film with the picture on one side and the sound waves on the other, was made here today by Frederick W. Hochstetter, inventor, of Pittsburgh, Pa.

In place of involved, expensive, mammoth devices, this new invention is so small it can be put into an ordinary pocket. Further than this, it is not necessary to have sound chambers, or perfect quiet to transpose the voice to the film.

Although the feasibility of employing anything other than celluloid film has not been considered before, Mr. Hochstetter explained that, in his opinion, the non-transparent film is much simpler than the transparent.

By a reflection of light upon one side of the opaque film, instead of a projection of light through ordinary celluloid film, the image or picture is thrown upon the screen. At the same time this is going on another ray of light is playing upon the sound waves which have been recorded upon the back of the opaque film.

Hochsetter has also devised a method, using the same idea, for ordinary film. Instead of recording the sound waves on the back of the film, they are caught on the edge of the film.

Patent Process, Inc.

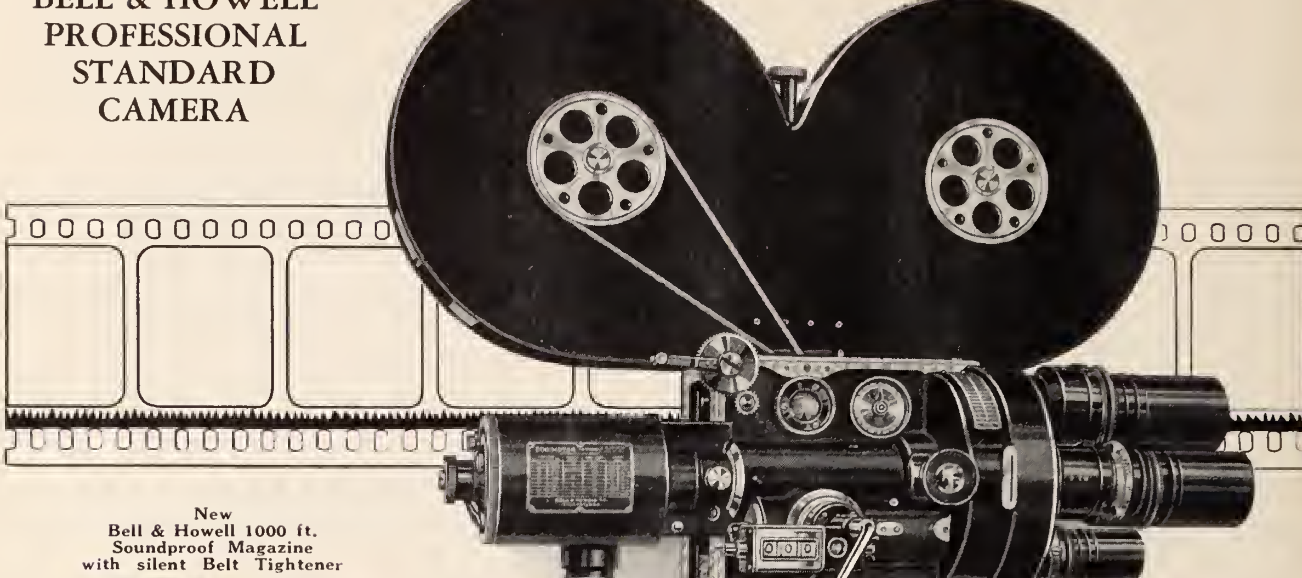
Patents Process, Inc., owner of the Frank Williams, A. S. C., and allied patents, has, THE AMERICAN CINEMATOGRAPHER is informed, optioned its entire holdings to the Halperin Brothers, representing a group of Wall Street bankers, for $5,000,000, the option having now less than sixty days to run. Patents Process, Inc., is a closed corporation officered by Wesley Smith, President; Simeon Aller, Secretary and Treasurer; Frank Williams, Vice-President and General Manager.

THE AMERICAN CINEMATOGRAPHER is informed that the prospective purchaser of Patents Process, Inc., will immediately, if and when the deal is consummated, proceed to construct in Hollywood the largest special process, miniature and research laboratory in the world and which will be the central point of production of all work falling under the several patents controlled by Patents Process, Inc. The new organization will wield a tremendous power in the industry, both as to financial resources and as to its control of the money-saving devices of production.

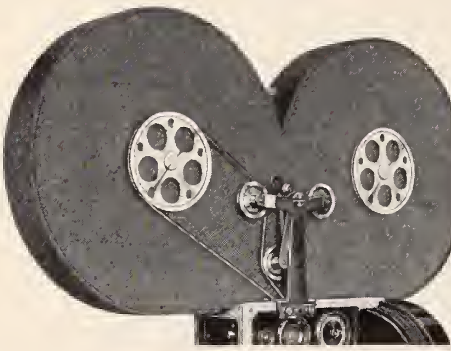
"Sound Waves"

Editor Cedric Hart is making a success of **"Sound Waves"** at the jump-off. The publication is devoted to "Heralding the epoch of Science in Pictures." **"Sound Waves"** is published at No. 1711 Winona Boulevard, Hollywood. THE AMERICAN CINEMATOGRAPHER bespeaks for **"Sound Waves"** a great future.

BELL & HOWELL
PROFESSIONAL
STANDARD
CAMERA



New
Bell & Howell 1000 ft.
Soundproof Magazine
with silent Belt Tightener



SILENT

for sound recording purposes

Bell & Howell sound recording cameras have been made so silent that some studios do not use a soundproof booth in operating them.

With the whole world clamoring for talking movies of the highest order, Bell & Howell standards of camera precision are demanded now as never before. So successful have been the results of Bell & Howell's past six years of research, mechanical refinements and collaboration in the industry that the following leaders now use Bell & Howell silent standard cameras in sound recording work.

Fox-Case Corporation—Producers of Movietone; Hal Roach Studios; Metro-Goldwyn-Mayer; Paramount-Famous-Lasky; Universal Pictures Corporation; Bell Telephone Company; Bristol Company; De Forest Phonofilms, London and U.S.A.; General Electric Company; Powers Cinephone Equipment Corporation; R.C.A. Photophone, Inc.; Western Electric & Mfg. Co.; Westinghouse Electric & Mfg. Company.

A very popular element in "talking movie" production is the new *Bell & Howell 1000 ft. Soundproof Magazine with Silent Belt Tightener for Bell & Howell professional camera, shown above.*

Consultations on standard cameras and silent equipment for sound recording purposes are invited.

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Sound Engineers Confer With M. P. Technicians

By Paul H. Allen, *A. S. C.*

A meeting of the Sound Engineers of the Bell Laboratories and The Society of Motion Picture Engineers (Pacific Coast Section), the Technicians' Branch of the Academy of Motion Picture Arts & Sciences and The American Society of Cinematographers was held in the rooms of the Academy, Roosevelt Hotel, Hollywood, on the evening of January 23, 1929.

The meeting was called to order by J. T. Reed, of the Technical branch of the S. M. P. E., who introduced Mr. John Lyng, Vice-President of the Electrical Research Products, Inc.

Mr. Lyng stated that the Electrical Research Products Corporation is a subsidiary of Western Electric and was organized for the marketing and sales of by-products of the research laboratories. He said that it is a long path from the original experiments of Alexander Graham Bell to the present trans-oceanic telephone from Los Angeles to Berlin. At present radio enters into this hook-up, but it is not a secret that the Bell Telephone system is now building a "loaded" telephone cable which will be laid on the floor of the Atlantic and will give direct phone service by wire to Europe. It was logical for the Bell Company to enter the motion picture business. The Bell Laboratories, a separate corporation, have made a study of sound for fifty years and the transfer of sound waves into electrical waves and return is the basic business of the Bell system of telephony.

Mr. Lyng further stated that in the experiments to analyze speech special devices were developed to measure the minute electrical energy used in the transmission of speech and in the experiments to analyze speech sound equipment was designed to handle. The first type used was the wax disc recording; film recording experiments started early too. This led naturally to the development of electrical recording. The first experiments used the familiar transmitter carbon button, electro-magnetically actuated. Then the question arose, why not synchronize the recordings with film? Crude attempts were made which proved that it was physically practicable. They had two ways to market the electric recording system; one to the motion picture industry and the other through the phonograph industry. The motion picture people didn't accept it at first, though the phonograph manufacturers did. Finally one film manufacturer did, and "quite a nightmare resulted."

Mr. Lyng stated in closing that those present should consider themselves free to ask any questions of a technical nature and which would be gladly answered by Mr. E. C. Wente or Dr. Donald MacKenzie of the Bell Telephone Laboratories.

Director William C. DeMille stated that he was now working on his third sound film, a feature wherein he was trying to devise a new technique in sound film presentation. He stated that too much stress has been put on technical sound recording and that the limitations placed upon the director by the sound engineers have greatly hampered the dramatic development of stories. Mr. DeMille feels that the dramatic development and telling of the story is of first importance, and if anything should suffer it should be the sound record: "For if we have a perfect technical sound record, and a poor picture, there isn't an audience that will go to see technical successes."

Mr. Roy Pomeroy, A. S. C., brought up the question of a temperamental star resenting the appearance of the microphone on the set and stressed the added difficulty of the "mixer" in securing correct recording of the scene.

Dr. Donald MacKenzie answered by stating that after all the microphone was just another added bit of equipment to the already overcrowded stage, and he couldn't see her point of view, though it was perfectly possible to hoist the instrument up out of her range of vision.

Mr. Douglas Shearer, A. S. C., sound engineer with M-G-M, asked when the volume range of the microphone was going to be increased.

Mr. Lyng, in answering, asked the question: "How wide an area do you want?" We are in this business to stay and acknowledge our responsibility, and that the problem is a large one. $1,250,000.00 has been appropriated for experimental work this year. And further promised that a percentage of the profits arising would be placed back in the fund for constant research and experimentation.

Mr. Karl Struss, A. S. C., now engaged in the photographing of Miss Mary Pickford's new picture, "Coquette," outlined some of the problems confronting a cinematographer while making a sound picture.

Mr. J. Boyce Smith, of Inspiration Pictures and Tec-Art Studios, asked: "Do you feel that the problem of sound-proofing of stages is over or under done?" He also asked: "Did you engineers come out here with any preconceived ideas on sound-proof construction based upon your past experience in phonograph record recording rooms?"

Mr. Lyng replied that sound-proofing is to keep noises out, that it is merely a shell constructed over a set to exclude the foreign noises. It wouldn't be exactly correct to hear trolley cars going by if the scene being depicted was supposedly in the center of the Sahara Desert? After the shell is built it must be equipped to destroy reverberation. The resonance must be destroyed. Sound pictures have been made without stage equipment, but the cost of retakes must have been high. The similiarity between phonograph records and sound records ends at the disc itself. In a phonograph recording room the reverberation is correct; but for sound films it is not. When the phonograph record is reproduced in the home the rooms are naturally dead and the resonance of the record is pleasing; but the resonance of the sound film record is furnished by the theatre walls in which it is reproduced. Therefore we record in a live room what we reproduce in a dead room and vice versa. The broadcasting room is constructed on the same basic principle as the record recording room. The two problems are entirely different in the question of acoustics.

Mr. Saville, of the British International Films asked what process was used in "duping" of sound from wax record to wax record after a film had been cut and the necessary sound transferred to a master record.

Mr. Lyng replied that he did not know what method was being used by the Warner Company and that they rightly guarded this process as a secret one. The usual method employed where they desire the sound accompaniment to be on disc records, they first record sound on the film and then after the film is edited and the necessary changes made in the sound track, they then record it on the wax record.

Mr. Fred W. Jackman, A. S. C., famous technical cinematographer and director asked why they were now using several cameras instead of making each individual set-up separate as we have been doing in our silent productions. That inasmuch as the photographic quality of the productions necessarily suffers from the multi-camera methods of production. This question of Mr. Jackman's brought on a heated debate between the sound engineers and cinematographers as to whys and wherefores of sacrificing of photographic quality to the sound track reproduction. After over an hour's many-sided debate, Mr. Jackman asked the chairman if he could consider then that it was entirely up to the director as to whether or not to photograph by the multi-camera method, or to continue with sound film production as we have heretofore. The meeting adjourned at 11:15 p. m.

Composite Photography

This Article Was Originally Presented at the Fall Convention of the Society of M. P. Engineers Held at Lake Placid, N.Y., Sept. 1928

By C. Dodge Dunning

Of the Dunning Process Co.
Hollywood, Calif.

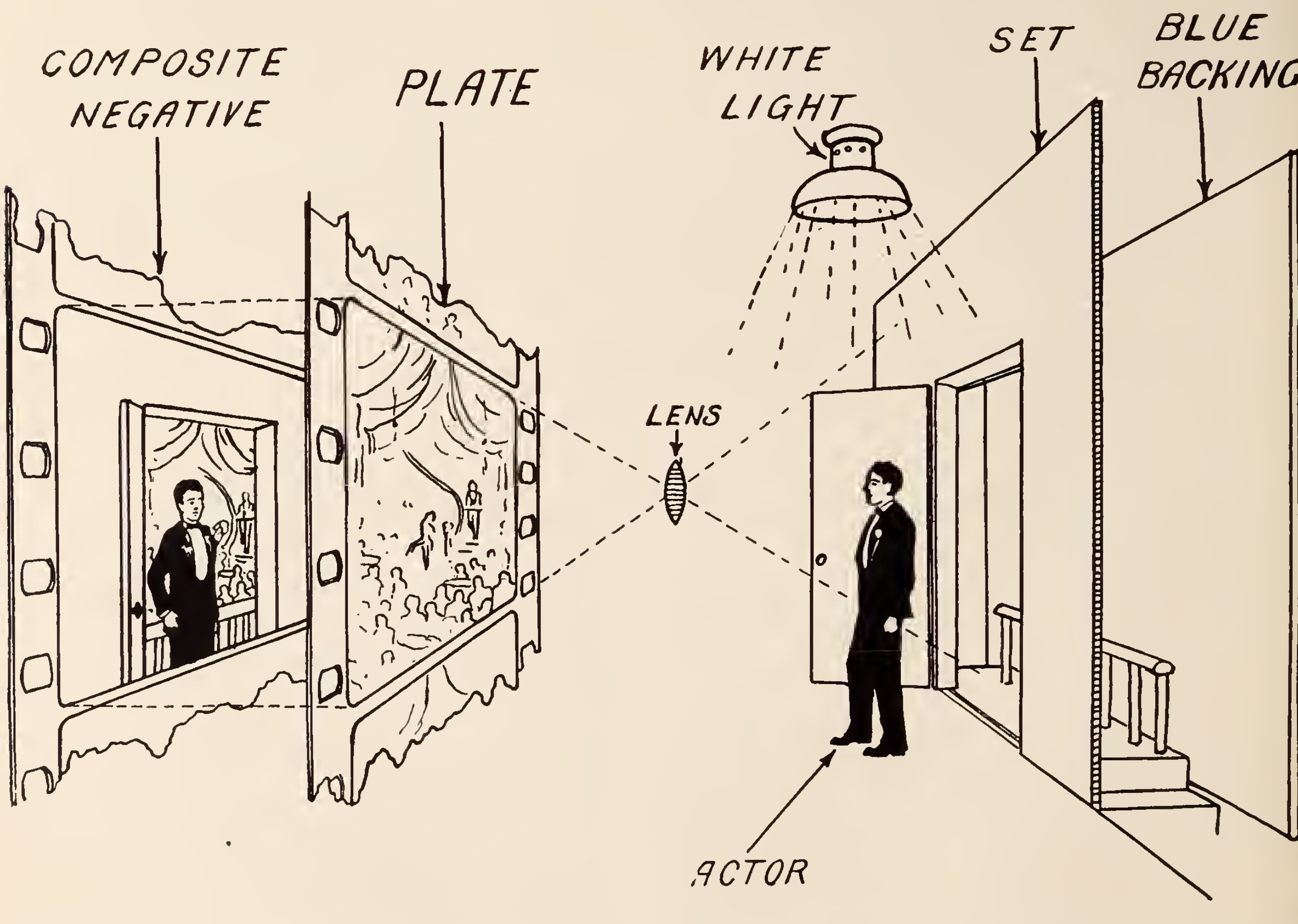
Composite photography has received marked attention in the motion picture industry. The ability to double-expose actors, without phantom, into miniature action, or into distant location shots, has proven an interesting technical adjunct to motion picture production.

For several years this line of endeavor has been almost entirely confined to methods requiring a mat or silhouette which protected the space to be occupied by the actors in the image area of the background scene. This mat protection was generally introduced during the printing or exposing of the background image and later the negative of the actors who had been photographed in front of a black or white background was printed into the unexposed space previously protected. Patents were issued to Frank D. Williams for a specific method of producing mats, double-printing, etc., and he has done some very successful work for the studios of Hollywood.

are of superimposing, without phantom, by displacing one image for another in any given section of the film area and permitting the free movement of the actors. The Schufftan process as I understand it, confines the action to a pre-determined section and exposes the surrounding background scene into the remainder of the film area simultaneously by means of mirrors or prisms.

Hans Goetz, of Munchen, Germany, secured a British patent in 1921 for use of a colored background and securing simultaneously two exposures through complimentary filters. This patent appears rather basic in character for this particular method of mat making. It was never patented in the United States.

A United States patent for composite photography was issued to Roy Pomeroy on June 12, 1928. The method apparently describes the use of a colored single image



Max Handschiegl, now deceased, invented a method of producing a mat by placing a colored background behind his actors and by the use of interposing filters, securing two color separation negatives with contrasting backgrounds, which enabled him to create a mat therefrom. Others have attempted varying means of producing mats. The Schufftan process of German origin, being limited to double exposing two or more pictures on separate sections of an image area, does not come within the scope of this article, which I wish to confine to the

transparency, such as blue, made from a background scene which transparency is placed forwardly of an unexposed negative on which is to be photographed a foreground action. Behind the foreground action is a colored wall. The actors are lighted the same color as the single image transparency. The wall is lighted in a color complementary to the transparency and complementary to the foreground action. He makes provision for the uneven photographic density of his blue transparency to

Concluded on Page 16

Clarence Brown, directing LEWIS STONE *and Dorothy Sebastian in a scene from the new Metro-Goldwyn-Mayer picture, "A Woman of Affairs"* blue light by using a separate negative transparency of the same scene, which is dyed in an intermediate color.

A United States patent was issued to me January 2, 1927, for a process of composite photography which has entirely eliminated the use or need for a silhouette, or protecting mat. Having spent several years prior to patent issuance in developing this process, I am in a position to discuss it more comprehensively.

An original negative of a background scene is furnished me by a motion picture producer. Whether it was made from a miniature, a high speed shot containing action, or a stock library shot, is immaterial. From this a double image transparent print is made containing a positive image of a certain color, say red, and a negative image of a neutral shade, say gray. By successive tests, we ascertain the kind of a double image print which when exposed forwardly of an unexposed panchromatic negative to an approximately white light, will equally fog the negative. It is absolutely essential that this two-image print be of equal photographic density to panchromatic stock as will be seen shortly.

This double-image print is then loaded into an intermediate magazine on the camera which is to photograph the foreground action and is threaded across the aperture in front of and in contact with the unexposed panchromatic negative. Behind the actors or foreground set, is a blue background.

By lighting this foreground action with an approximately white light or a light which is neutral to both colors of the transparent print, this double-image print becomes nothing more to the action than an evenly balanced filter wedge and therefore does not present an uneven obstruction which would cause phantom. Simultaneously with the photographing of the foreground action, the unobstructed blue area back of the actors is acting as a printing light for those sections of the scene on the double-image print, which are not occupied by the photographed action.

The result is a completed composite negative which is developed in the usual manner and exhibition prints made therefrom along with the regular work in any commercial laboratory. In all cases the producer sees the finished results on the screen the next morning, when he is reviewing the "rushes" of the previous day.

We have just finished double-exposing a series of battle scenes where the plate or double-image transparency, was made from a negative showing the enemy fleet in action, taken with a high speed camera; the enemy fleet comprising an array of twenty-seven miniature frigates on a four-acre lake. Into this we double exposed foreground action, life size, showing the deck, cannon fire, etc., of the hero's flagship. Unfortunately we are not permitted to exhibit this work prior to the public release of this big feature production.

This process of double exposure finds a very practical use in connection with sound pictures. In cases where the foreground action presents dialogue in a presumably remote or difficult location, the latter is previously "shot" in silence and doubled into the action shot taken on the sound-proof stage. In other cases, such as a cabaret scene, the foreground dialogue is recorded on the sound-proof stage, while the music and chatter of the cabaret is introduced synthetically only when the door is opened. Another illustration is the "close-up" conversation of Douglas McLean and the girl, doubled into a silent street, whose noises are afterwards placed so as not to interfere with the conversation.

This shot, to be made in the regular way, would have required an elaborate traveling sound recording equipment, as well as expensive generator trucks and other moving illuminating paraphernalia. As shown in the demonstration it was "shot" on the studio stage in a very small space and the previously taken street panorama in motion was doubled in simultaneously.

Visual Education

Mussolini and the League of Nations Lead the Way in a World Movement to Fight Ignorance With Films—A.S.C. Has Idea

By Joseph Dubray, *A.S.C.*

This is the story of how the conservative Old Country forges away ahead of the ultra progressive United States in a matter which not only is of international importance, but which marks one of the greatest evolutionary steps in the history of mankind. In a well documented article due to the pen of Mr. Michel Coissac, editor of the French magazine, "Le Cineopse," we read: "At the International Convention of the Cinema, held in Paris from September 26 to October 3, 1926, the third committee, which was intrusted with the investigation of all matters pertaining to visual education through motion pictures, provoked from the convention a vote of approval on not less than thirty-five articles which had been carefully studied and discussed by the committee.

"Article 14 proposed that **an International Bureau of Visual Education through motion pictures be established,** that it be directly affiliated with the League of Nations and that **its members be drafted among technicians and specialists of the cinema of recognized ability."**

One of the missions of the bureau was to prepare an analytic catalogue of all the films in existence which are susceptible of being used for the purpose of visual education.

One year later, September 6, 1927, at the third general meeting of the League of Nations, held at Geneva, Senator Cippico, in the name of the Italian Government, declared that his government was fully aware of the importance of motion pictures as a medium for the advancement of education, and judging that "**the industrial world itself does not consider motion pictures solely as a speculative medium, but also has a real vision of their power as a medium both dignified and practical for attaining a lofty ideal,**" it had decided to "**propose the creation of an International Institute of the Educational Cinema which should have its seat in Rome and which, according to Article 24 of the agreement, should be placed under the jurisdiction of the League of Nations.**"

"To this effect the Italian Government offers not only the necessary funds for the organization as well as the maintainance of such institute, but also to provide for it headquarter offices in the historic Palace of the Stamperia in Rome."

"It will thus be possible for all nations to participate in the creation of the Institute with equality and freedom of action and without financial problems of their own nor charges on the budget of the League of Nations."

Such generous offer was accepted by the League of Nations, and the Italian offer was further confirmed by a letter from Premier Mussolini, dated January 7th, 1928, in which the "Duce" stated that his government:

"Pledged itself to create and maintain an Institute of the Cinema for visual education which would be placed under the jurisdiction of the League of Nations and the seat of which would be in Rome."

The Italian legislature approved of a budget of 600,000 lire per year for a period of ten years towards the covering of the expenditures of maintenance. This was subsequently ratified by Royal Decree No. 2480 of September the 6th, 1928.

It was also tacitly understood that this period of ten years may be extended for subsequent periods of ten years each.

Finally the Italian Government with another noble gesture decided that the Palace of the Stamperia would be inadequate to the needs of the Institute and offered the magnificent Villa Falconieri, at Frascati, near Rome, for the purpose.

On November 5th, 1928, in the presence of His Majesty the King of Italy, of Mr. Mussolini and of dignitaries and representatives of the Nations members of the League of Nations, the **Villa Falconieri** was officially presented to the League.

In his speech of remittance, Mr. Mussolini said:

"There are, among other thousands, three discoveries each one of which mark a new era in the history of civilization—the discovery of the printing type, invented in the middle of the fifteenth century; the discovery of the camera oscura a century later, and finally the invention of motion pictures.

"These discoveries represent three fundamental steps in the progress of human thought. They are three formidable instruments for the conquest and dissemination of culture.

"Motion pictures, which are as yet in their first period of development, present over the book the great advantage that they speak to the eye, that is to say, speak a language known by all nations on earth. From this they derive a universal appeal and offer innumerable possibilities for educational co-operation of an international character."

While the motion picture industry in the United States was developing and giving tremendous impulse to the cinema solely as a **speculative medium,** as Senator Cippico has expressed it, the European countries, in spite of their less sound financial resources, in spite of frontiers and diplomatic difficulties, in spite of the differences of languages, costumes, traditions, could find sufficient spirit of initiative to come to an understanding for the common good and to **ACT,** setting thus a remarkable example before the world and proclaiming that **education knows no boundaries.**

The fact that the United States has not joined the League of Nations is of secondary importance, and becomes immaterial when the moral welfare of humanity is at stake. In fact the United States not only has a seat at the League as an interested and sympathetic observer, but this Nation contributes to the universal brotherhood by taking an active part in matters outside European diplomacy and politics as is proven by the fact that Professor Millikan, of Pasadena, has a seat in the League's council, created for the promotion and advancement of science.

The United States can and should co-operate with the International Institute of the Educational Cinema and to this end **it should first create a similar national institute for the purpose of co-ordinating and organizing within its own territory the systematic development of this extremely logical medium of education.**

The educational bodies of the United States have been for the past few years greatly interested in this matter and some of the universities, as Columbia, Yale, Harvard, the Universities of California and of Southern California and others have already devoted efforts and energy in a sincere attempt to give the cinema the place that is due it in the great educational scheme of the country.

Private enterprises have also followed the same path. First among all the Eastman Kodak Company is, with the co-operation of some of our greatest educators, liberally, unselfishly devoting time and capital to a systematic spread of the educational cinema.

All these efforts have nevertheless been more or less the efforts of individuals, all tending to the same finite scope and they suffer for the lack of that co-ordination which is essential in any motion picture enterprise.

Success of motion pictures depends entirely upon three fundamental factors which we may call the three KNOWS of the cinema:

Know WHAT to do.
Know HOW to do it.

Know HOW to DISTRIBUTE what you have done.

Motion pictures, whether they are made for entertainment, for education or for any other purpose, are a costly affair.

The WHAT to do can only be determined through the consensus of opinion of educators.

The HOW to do it can only be determined through the co-operation of these same educators and the experienced technicians of the screen.

The how to DISTRIBUTE the pictures once made can only be organized through the experience acquired by producers and distributors of pictures made for entertainment.

The producers, distributors and technicians of the screen have learned in the hard school of experience how to make pictures and how to make them serve their purpose through widespread and systematic distribution.

A nation-wide fusion of educators, technicians, producers and distributors is essential to the success of an institute of visual education.

If we consider the cold financial problems involved in such a project we find that philanthropists may generously endow with large sums an institute of visual education. The Government itself might be prevailed upon to subsidize this essential of modern civilization, but no matter how large may be the sums derived from these resources they would not suffice to guarantee a systematic and proper continuance and wide distribution of the films that may be made.

Films made for the purpose of visual education should be self- sustaining and, although philanthropic donations and subsidies from the Government and educational institutions would permit the organization of an institution and the making of films presenting onerous difficulties in their preparation, the general distribution of these films should be organized and systematized as a non-profit, but highly efficient, **business organization.**

All the problems, be they of an organizing, technical or economic nature should be met and discussed by qualified people or groups of people possessing a spirit of friendly co-operation and a high consciousness of civic responsibility.

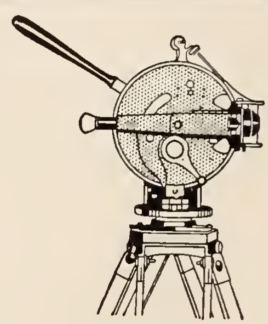
The "American Society of Cinematographers," conscious of the importance and the need of a movement for the purpose of definitely establishing in the United States the use of motion pictures in the educational field, advocates that a NATIONAL CONVENTION be held at the earliest possible date for the purpose of deciding upon the course to be taken in order to bring about the necessary co-operation of individuals and bodies as outlined in this article.

That the universities of the country be invited to send representatives to this convention.

That the Motion Pictures Producers and Distributors of America (Will Hays' organization), the Hollywood Association of Motion Pictures Producers, the Academy of Motion Picture Arts and Sciences, the American Society of Cinematographers, the Eastman Kodak Company, and the Government of the United States make all efforts to be represented by qualified members and representatives.

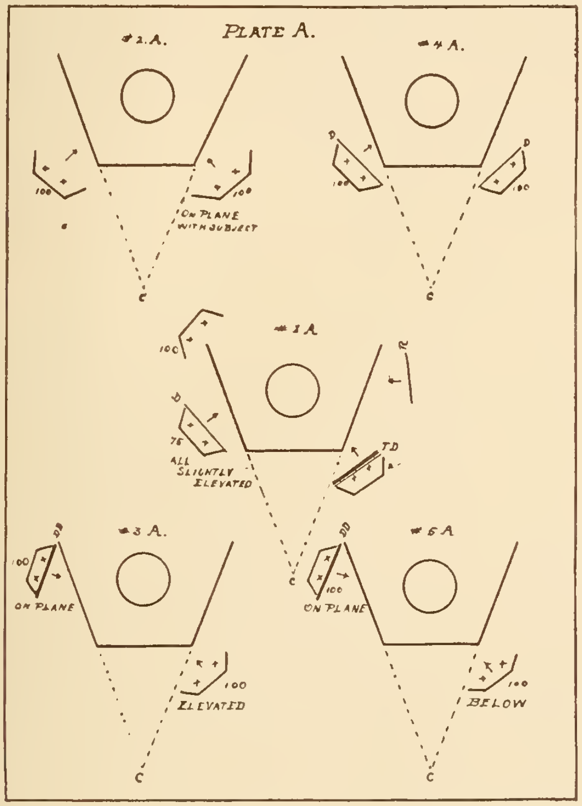
At this convention three special committees should be appointed whose duties should be to discuss and to recommend the procedures inherent to the educational, the technical and the economic aspects of the Institute. The committees should be afforded all facilities for meeting and should form the nucleus of the directing bureau of the proposed Institute. The chairmen of the committees should, at an appointed date, meet to correlate the findings of each committee and recommend their practical application.

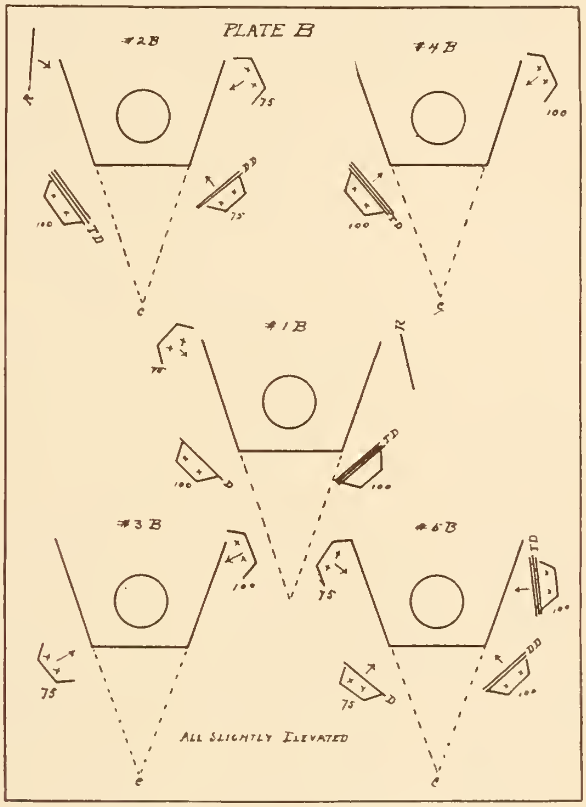
From such convention and through the organized efforts of the special committees, an institute of visual education could be organized in a relatively short span of time, be assured of the good will of the Nation, and prove the beginning of a long and honorable career.



By Request

[In the AMERICAN CINEMATOGRAPHER *of January, 1928, there appeared an article by Mr. Louis W. Physioc, of Hollywood, entitled "Does the Camera Lie." A feature of this article was the double truck cut composed of shots of the head of the Venus de Milo, which cut is reproduced in this issue. In the* CINEMATOGRAPHER, *of January, 1928, two plates, explanatory of the ten photographs of the Venus head, were omitted by mistake and the force of the article was thus greatly impaired. These two plates, showing the ground plans for the arrangement of the lamps to light the various shots, have been found and are here printed in connection with the double truck and with that part of Mr. Physioc's article which is explanatory of the lighting equipment and the proper placing of the units to secure the lighting effects as demonstrated in the various shots. See double truck pages 20 and 21.—Editor's Note.]*





". . . . . . . With the aid of modern lenses and panchromatic film we are looking forward to the time when some one will be bold enough to make some experiments with matt surface reflectors as the basic source of light, especially for close-up work, in lieu of direct lighting. Surely we have been given sufficient hints of the value of indirect lighting.

For the benefit of those who still believe that to preserve their beauty, it is necessary to burn out the blemishes with a blaze of light, it is our humble opinion that there is more security in Dryden's ancient lines, as true now as when he wrote them:

"'Tis every painter's art to hide from sight
and cast in shades what seen would not delight."

Plate A.

In the accompanying cuts, Plate A shows various treatments of the full face, and we may learn something by studying each individually:

No. 2 A. Shows the lovely Venus transformed into a stupid, gross featured, flat nosed, blear-eyed individual. Note the ugly cast shadows, from the nose, across the cheeks; and also, how well defined are the imperfections on the surface of the model. This effect is achieved by the popular burn-up method of throwing strong, open arcs, at the same angle, across the face. The whole is flat and uninteresting.

No. 4 A. Is a similar effect, except that the photographer has thought to help the situation a little by diffusing the light. However, it is still flat and uninteresting, due to too even a distribution of light. See how broad is the bridge of the nose, the eyes still dull and stupid, the mouth thick lipped and sensual and the surface of the face blotchy.

No. 3 A. Is more engaging, but is harsh and contrasty, and tends to destroy feminine delicacy by suggesting more an Adonis that a Venus. Observe the square, sharp cut effect of the nose and eye sockets. However, the eyes begin to assume a little expression—they are enveloped in shadow and the imagination comes to the aid of the plaster Venus. But study the surface—there is no disguising the fact that she is nothing more than cold, hard plaster.

No. 5 A. Here, the photographer has attempted to burn out a little fullness under the chin that seems not to have worried Venus, but annoys some of the present beauties. This method may accomplish its design, but see what else has happened—it makes Venus' right cheek appear inflamed with the tooth ache and her expression gives evidence of the pain—her eyes are rolling up in her head and her nostrils are twitching in her paroxysm.

No. 1 A. Shows the ideal system of lighting. All the features are softly rounded and modeled. The lovely work of this ancient and unknown sculptor is preserved and reproduced in all its feminine delicacy and charm. Compare the beauty of the lips and the sweetness of their expression to the other reproductions. Study the dainty

Concluded on Page 22

2

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A

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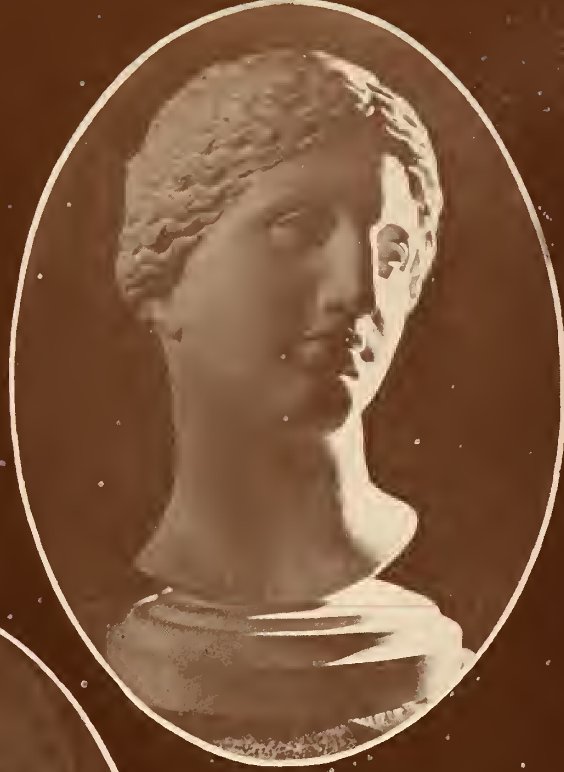

4

1

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B

5

By Request

Continued from Page 19

modeling of the nose, how round and shapely the head and we can almost feel the presence of the eyes. But most important of all, the imperfections on the surface of the cast are hardly noticeable and there is almost a feeling of flesh rather than the hard, cold plaster-paris.

Plate B.

This group shows the three-quarter view. This is an interesting pose of the head from the standpoint of drawing but presents a broad, flat area of cheek, which is not easy to keep from appearing flat. This pose is generally used under the assumption that one side of the face often appears more favorable than the other.

No. 2 B. Is softly back-lighted and the right side held in shade to present a little mystery to the imagination in taking care of the broad area of the cheek, also to hide an ugly blotch on the right cheek.

No. 4 B. Is the same pose, lighted too contrastily and gives a sharp, angular effect down the center of the face.

No. 3 B. In this picture, the few pleasing points of the two preceding lightings are destroyed and no semblance of effect remains, due to too strong and direct a light on the right cheek. Note how the blotches show up as soon as the harsh light is used, also the rough spots and deep, ugly shadows on the left cheek. Observe also the unbalanced expression of the eyes and the lack of any feeling of distance between the extremity of the nose and the right ear. This is just as apt to happen in photographing the living model.

No. 5 B. Here, the small area of the right side is held in shade and an attempt is made to throw the eyes in the shade to create expression and an apparent direction of vision. This scheme of lighting is favorable to light blue eyes. That portion of the cheek which bears the ugly blotch, is also shaded and there is beginning to be a feeling of roundness and distance between the nose and ear.

No. 1 B. Here there is a perfect sense of roundness. Note how the two cheeks seem to lead around to the back of the head. Observe the delicate modeling of the eyes and lips. The living model would require a little stronger reflected light in the shaded portions, but with the cast, too strong a reflect would give a crossed effect to the eyes. This like No. 1 A, is a very fair representation of the work of the great and unknown sculptor and all of these different lightings show that the camera can become a great liar.

We do not deny, however, that for dramatic reasons, some of these effects may be desired rather than avoided, and for those who may be interested, we offer a series of plans showing each arrangement of lighting:

100 represents the full, open unit (arc or globe).
75 a lesser amount, undiffused.
D the full unit with one diffuser.
DD the full unit with two diffusers.
TD the full unit with triple diffusers.
R reflector.

Color Sensitivity of Panchromatic and Infra D Film

[The accompanying interesting memoranda has just been transmitted to The American Cinematographer *by Dr. V. B. Sease, director of the Redpath Laboratory of the Dupont-Pathe Film Mfg. Corporation, Parlin, New Jersey. It is presented in its original form as prepared by Dr. White, physicist, of the Redpath Laboratory, with very slight deletions by our technical editor.—Editor's Note.]*

For many pictures it is desirable to produce a correct rendition of the brilliance of the objects photographed as independent of the color of the objects. Such rendition, termed orthochromatic reproduction, is usually approximated by use of panchromatic film with some correction filter to alter the relative intensity of illumination reaching the film in such a manner as to produce a final black and white picture approximating the brilliance values recognized by the eye.

Such orthochromatic rendition is frequently unnecessary and often not desired and various means are used to produce distortion for special purposes. Infra D film is a type that produces marked distortion. Spectrograms of panchromatic film, Fig. 1, and of the Infra D film, Fig. 2, are reproduced and show that green sensitivity present in the panchromatic is absent in the Infra D.

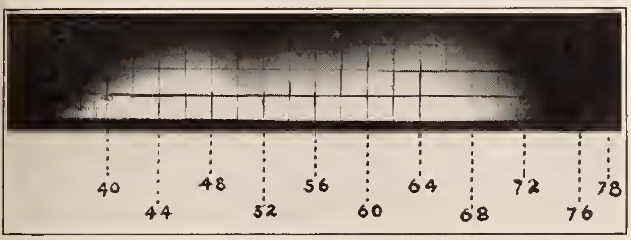

Fig. 1—Spectrogram made on panchromatic film

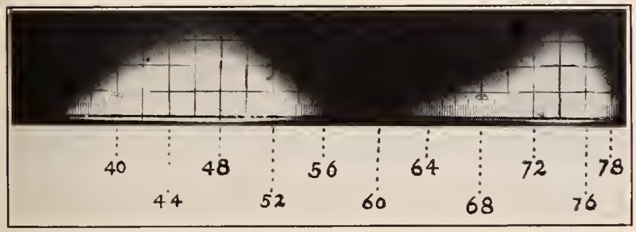

Fig. 2—Spectrogram made on Infra D film

These spectrograms also show for the Infra D an increased sensitivity in the far red and near infra red. These differences produce corresponding differences in the pictures produced. However, as few colors from foliage, buildings, clothes, etc., are spectrally pure, i. e., approximately monochromatic, the differences are easily overlooked in many pictures. This means that satisfactory pictures can be made even with relatively great variations of spectral sensitivity. For practical purposes it is rarely necessary and often undesirable to produce orthochromatic reproduction of the scene photographed. A pleasing picture is in many cases the criterion of good photography, rather than an accurate reproduction of the brilliance contrast of the objects. A wide departure from orthochromatic reproduction produces a pleasing picture in some cases, but usually a rather close approximation to such reproduction proves best.

The differences between the regular Panchromatic and the Infra D films can be shown in another way. Exposures made on a sector wheel with and without filters show differences due to the different spectral sensitivities of the two types of emulsion. Such results are shown by curves plotted in Figs. 3 and 4.

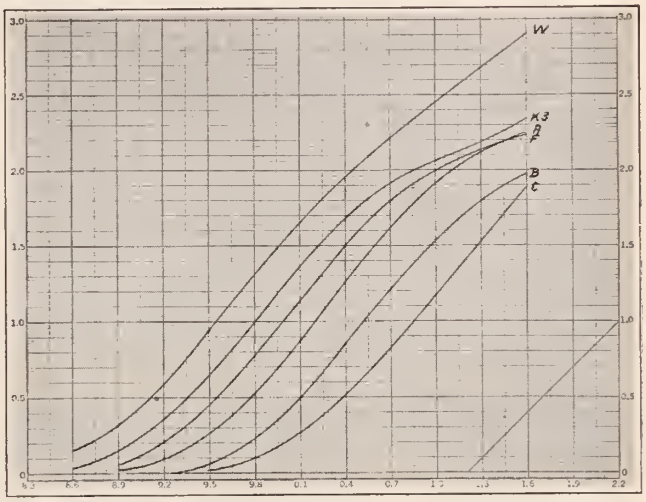

Fig. 3—H & D curves on panchromatic film. W with 2770°K source, unscreened. K3 with 2770°K source, screened by Wratten K3 filter. A with 2770°K source, screened by Wratten A filter. F with 2770°K source, screened by Wratten F filter. B with 2770°K source, screened by Wratten B filter. C with 2770°K source, screened by Wratten C filter.

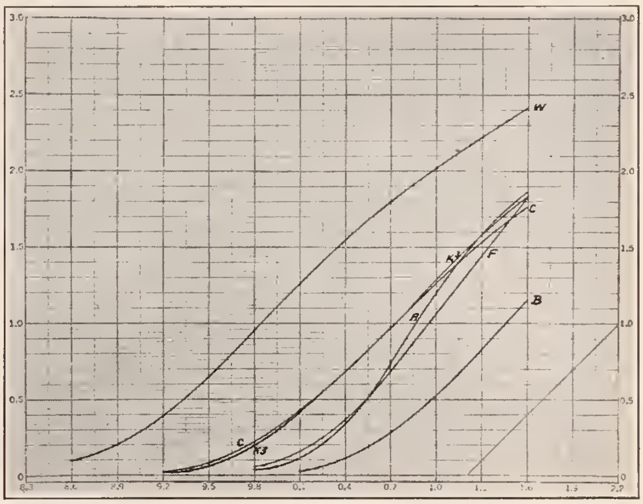

Fig. 4—H & D curves on Infra D film. W with 2770°K source, unscreened. K3 with 2770°K source, screened by Wratten K3 filter. A with 2770°K source, screened by Wratten A filter. F with 2770°K source, screened by Wratten F filter. B with 2770°K source, screened by Wratten B filter. C with 2770°K source, screened by Wratten C filter.

The light source was an inside frosted lamp, operating at a color temperature of 2770°K and giving, unscreened, an illumination of 5.85 meter candles at the plane of the exposed strips. The wheel was driven at such a speed as to give an exposure of .150 seconds at the aperture, corresponding to a log E value denoted 0.1 on the curves. The exposure time increased and decreased by factor two steps above and below this value. Exposures to the source indicated were made with no screen and then with certain of the Wratten light filters, indicated in the figures, between the light and the film.

Continued on Page 24

The curves show the results of such exposures and Table 1 shows both the visual and the effective photographic transmission of these filters for this source of color temperature 2770°K.

TABLE 1

Effective Photographic Transmission of, and Filter Factor for Various Filters on Dupont Panchromatic and on Dupont Infra D, with an Incandescent Lamp, 2770°K Color Temperature. The Total Relative Visual Transmission of These Filters Is Also Given.

Filter	% Visual Transmission	PANCHROMATIC % Transmission*	PANCHROMATIC Filter Factor*	INFRA D Transmission*	INFRA D Filter Factor*
K3	80	59	1.7	13	7.4
F	7.1	22	4.6	6.9	14
A	24	37	2.7	7.6	13
B	26	10.5	9.5	2.3	43
C	2.3	5.2	19	13	7.4

*The values used correspond to density 0.7 on the curves of Figs. 3 and 4.

A comparison of columns 2, 3 and 5 of Table 1 shows the magnitude of the differences between the reproductions with these films, and orthochromatic reproduction. On the positive print from the panchromatic film, in general, blues and deep reds will be rendered lighter than with orthochromatic reproduction, greens and yellows, darker. With the Infra D film, differences are greater. With this film the subtraction of blue by the K3 filter gives only an effective transmission of 13 per cent, as against a visual transmission of this filter with this source of 80 per cent. On the other hand, the C filter used, which passes red light of wave lengths greater than 740 millimicrons, has a visual transmission of only 2.3 per cent, while the photographic transmission on Infra D film is 13 per cent. The comparison of the visual and photographic transmission for the other cases show that departure from orthochromatic rendition are much greater for the Infra D film than for the panchromatic material.

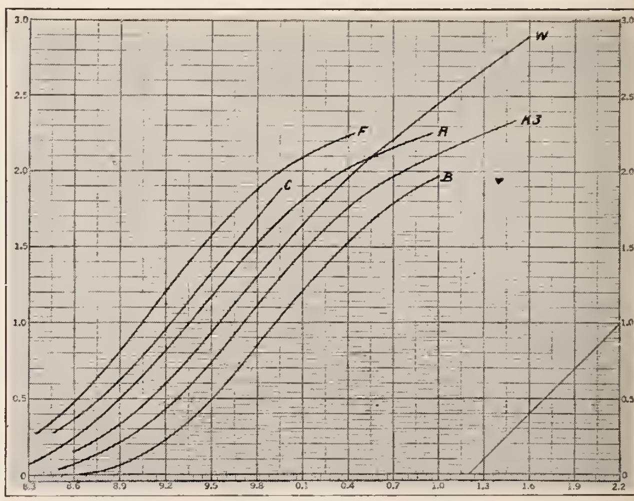

Fig. 5—H & D curves on panchromatic film shown in Fig. 3, displaced to represent equal visual brightness for the different filters at the same point on the log E axis. (This assumes the reciprocity law.)

As a second means of visualizing these facts the curves shown in Figs. 3 and 4 are replotted in Figs. 5 and 6.

Each curve is shifted on the log exposure axis an amount equal to the log of the reciprocal of the total relative visual transmission of the filter used in obtaining the curve. A film that had the same sensitivity characteristics as the eye would have the curves as now plotted all coincident. The actual curves are not coincident. On the panchromatic material, Fig. 5, the F, C and A filters are rendered as too bright, the discrepancy for the F filter being greatest and for the A filter least, while the B and K3 filters appear as too dark, the discrepancy for

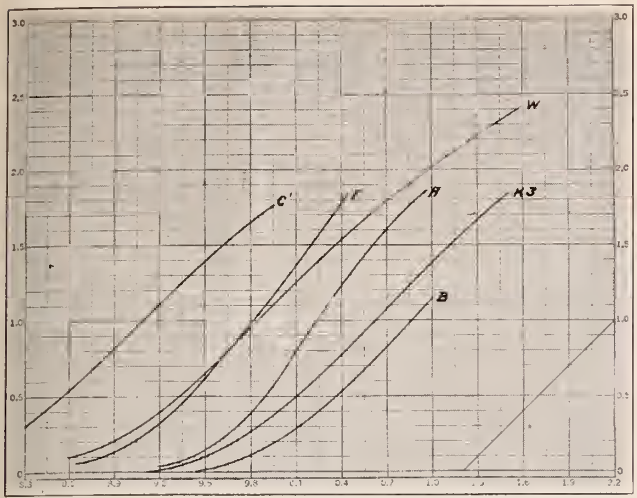

Fig. 6—H & D curves on Infra D film shown in Fig. 4, displaced to represent equal visual brightness for the different filters at the same point on the log E axis. (This assumes the reciprocity law.)

the B filter being the greater. With the Infra D material the contrast changes with the change of filter are more marked than for the panchromatic material, but still it is possible to easily distinguish in a general way the differences from orthochromatic reproduction. Here the C filter is rendered several times too bright, while the F filter appears approximately correctly placed. The B, K3 and A filters are all rendered too dark, the departure of the B filter being greatest and of the A least.

From the results just presented it is evident that a correction filter to give orthochromatic reproduction with regular panchromatic material must transmit more in the green and yellow region than it does in the blue and far red. As Jones [1] has pointed out, the correct character of such a filter depends not on the light source but only on the nature of the emulsion, and also that it is too dense for practical work. Hence, it follows that such a correction filter calculated and made for one emulsion will not in general be correct for another emulsion. The character of such filter for Infra D stock, if one were attempted would be very different than for regular panchromatic material.

When we come to a special field where correct rendition of object brightness is not desired, there are possibilities in the Infra D film largely absent in the panchromatic material.

Fig. 7 shows pictures taken in direct noon sunlight at the corner of a red brick building with green foliage and blue sky also in the picture. The board in the hands of the person there pictured was covered with a gray felted paper, approximately neutral in character. The pictures were taken at the stops indicated corresponding approximately to the filter factors given in Table 2, keeping camera speed constant. The prints used for the reproduction from either negative material were made at the same time on one sheet of paper, so either series, at least in the original print, gives a basis of judgment of accuracy of determination of the filter factors employed as well as showing the pictorial differences produced. Here again, the lack of green sensitivity of the Infra D film is shown by the fact that after the practically complete subtraction of blue by a short wave cut filter, there was practically no change of filter factor necessary, though the color and visual density of the filters employed varied widely. Again the Infra D film shows the foliage as light in color with a short wave cut filter and corresponding increased lens aperture, while the corresponding pictures on panchromatic material show no such character, even with the deepest red used, the No. 70 Wratten filter.

(1) Loyd A. Jones "Light Filters." Part Three. American Cinematographer, Vol. IX, No. 2, p. 13, May, 1928.

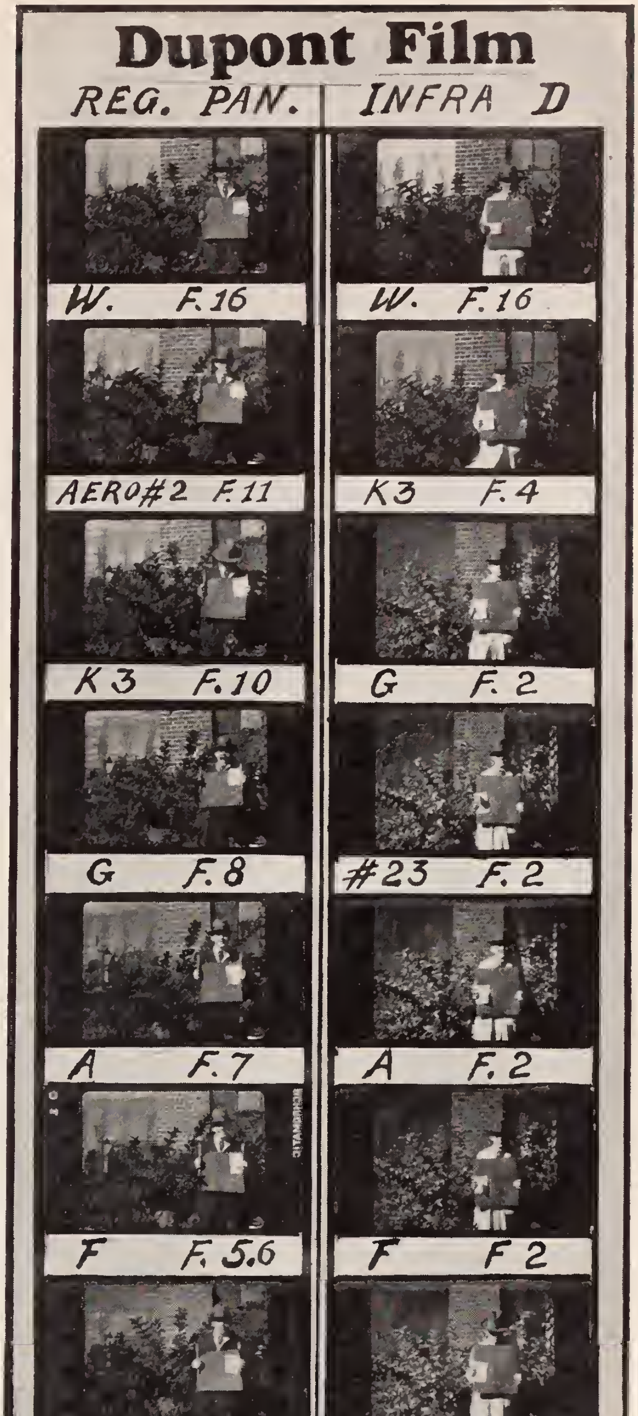

Fig. 7—Left, photographs on DuPont panchromatic film in direct sunlight. Right—photographs on DuPont Infra D in direct sunlight Both with record of the Wratten filters and lens stops used.

TABLE 2

Filter Factors Indirect Sunlight for Certain of the Wratten Light Filters

Filter	Panchromatic	Infra D
Aero No. 1	2	....
K3	3	16
G	3.5	55
23	..	60
A	6	64
F	8	64
70	64	64

A.S.C. Approves Vitacolor

By John W. des Chenes

Vitacolor—cinematography's newest color sensation—has been received with rare enthusiasm wherever it has been demonstrated; but it passed its severest test on the night of January 7, of this year, and so did its inventor.

Imagine your own embarrassment if you were the discoverer of this process and suddenly found yourself among fifty fellow-members of the American Society of Cinematographers, before whom you were supposed to display your wares! Can you conceive of a more critical audience to entertain under the circumstances? Do you suppose the men who compose the heart and soul of the motion picture industry would resort to undue praise or flattery over a subject so vital to their future interests as colored photography? If anything, would they not be apt, through their training and natural sense of observation, to find glaring faults which the average layman would overlook?

In any event, I should rather have stood in Daniel's shoes and faced the lions than to have been Max B. Du Pont on the night in question. Mr. Du Pont, of course, needs no introduction as the man whose brain conceived Vitacolor.

But I am rapidly coming to a misleading point. I have only congratulations to offer Mr. Du Pont, and no pity. For I can say without hesitation, having eyes and ears for a good purpose, that Vitacolor has received the official stamp of approval by that splendid body of men who play such an enormous part privately and such an insignificant role for the public to see in one of the world's greatest industries. I know that Mr. Du Pont was more touched by the enthusiastic ovation accorded his discovery on this occasion than upon any other. And justly so. It is only natural to value most that praise which comes from honest lips and critical minds unbiased by friendship.

So they came, these cinematographers who have "cranked" scenes whose aggregate cast runs into billions of dollars. They wanted to see if Vitacolor really stood up to its advance notices. With them was Joseph A. Dubray, technical editor of the A. S. C. Magazine, and a cinematic technician of world-wide reputation.

Max Dupont, Inventor of Vitacolor, and Miss Mary Mabery, the "Vitacolor Girl."

To do the men credit, all but Mr. Dubray, who had seen Vitacolor before and proved something or other by his willingness to re-attend a demonstration, I should not be surprised if they had come prepared for a disappointment. Not are they to be blamed. If the "perfect" motion picture color processes that have been discarded by producers as useless could be laid end to end—you know the rest. Hollywood is a place where men suddenly pop at you from around a corner and shout:

Welcome to Rainbow Road

THE AMERICAN CINEMATOGRAPHER hereby extends a whole-hearted welcome to **The International Photographer,** voice of the International Photographers of the Motion Picture Industry, just issued. The new publication is the official gazette of the I. P. M. P. I., and will be issued monthly from the Hollywood headquarters of the organization in the Markham Building. To Ira Hoke and Art Reeves is due a lot of credit for the work they did in getting the first issue on the press. Improvements will be made as the months reel off and among these will be an original front cover design by Louis W. Physioc. The I. P. M. P. I. is affiliated with the I. A. T. S. E., and has a membership of more than seven hundred. The new member of Hollywood's steadily growing family of film publications looks like a winner before the ink gets dry.

Mr. John F. Howell, secretary-treasurer of Akeley Camera, Inc., was a caller at A. S. C. headquarters during January. He reports much interest in the new Akeley tripod and considerable business in sight.

Mr. R. E. Farnham, of the National Lamp Works, Nela Park, Cleveland, Ohio, is in Hollywood studing the light situation. He will address the A. S.C. on the general subject of picture lighting on the night of Monday, February 4th, at A. S. C. headquarters in the Guaranty Building, Hollywood.

"At last, I have invented a color process that will revolutionize the movies!" The familiar refrain has become almost as tiresome as "Sonny Boy."

But, seated among the ghosts of early screen successes that had their inception in the old Lasky Realart Studios, where Vitacolor is now being made ready for professional and amateur use, the A. S. C. members had not to be shown more than two or three scenes before they became lavish with their applause. Especially was this so during the projection of scenes along the Monterey Coast. Nearly all of those present were familiar with the delicate coloring with which Nature has imbued this memorable territory. And when its likeness, to an exact nicety, was thrown upon the screen, repressed enthusiasm was out of the question.

And fish! I can hear you say there is nothing to get excited about in an undersea denizen, save when you have landed a big one. But this was different. The applause elicited from those fifty-or-more pairs of hands when they were shown pictures of gold and silver fish swimming lazily above vari-colored pieces of coral and stone, was spontaneous because their owners had seen gold and silver fish before, and knew if the coloring was natural or not. Scenes of the last Tournament of Roses parade, at Pasadena, were likewise accorded a great ovation.

And when Mary Mabery, screen star, looked out from the silver sheet upon what will probably prove to be her most critical audience, I think she was largely instrumental in winning half-a-hundred new friends for Vitacolor. Few tints are harder to reproduce in photography than the coloring of the human flesh. This was done to the enthusiastic satisfaction of everyone present. It was, as one cinematographer expressed it: "Like looking at someone you knew wasn't real, yet you had to believe she was." For the excellent adaptation of her type to colored cinematography, Miss Mabery has earned the title of "The Vitacolor Girl."

The evening turned out to be one of deep appreciation all around. Mr. Du Pont's confreres in the A. S. C. did not attempt to conceal the pride they felt that from their ranks was born one of the most important developments of cinematography. And the inventor of Vitacolor was profoundly moved by the plaudits and interest displayed by his associates.

In playing host to the Cinematographers, Mr. Du Pont was assisted by Harold S. Ryerson, general manager of the controlling company of Vitacolor, who promised that the new process will be made ready for the professional screen as quickly as a surplus demand for attachments for amateur cameras can be supplied.

Projection Advisory Council

The Projection Advisory Council has been organized to "Develop a better realization of the importance of good projection and to assist all activities seeking to improve projection conditions." This is a broad and comprehensive declaration, requiring much detailed explanation, but the plans which are quite simple and workable have received the strong endorsement of Government and Municipal Departments, large industrial and commercial organizations, engineering and projection societies and many of America's best known projectionists.

BOARD OF DIRECTORS

Lester B. Isaac, President, Supervisor of Projection, Loew's Inc.
Laurence Jones, Secretary and Treasurer, formerly Editor of "American Projectionist."
J. Clayton, Capitol Theatre, New York.
W. Ricks, Palace Theatre, Washington, D. C.
C. Greene, Minneapolis, Minn.
A. Gray, Lancaster Theatre, Boston, Mass.
E. Keller, Chinese Theatre, Los Angeles, Cal.
L. Katz, Regent Theatre, Harrisburg, Pa.
H. Rubin, Supervisor of Projection, Publix Theatres, New York.
L. Bowen, New York.
C. Johnson, Supervisor of Projection, Fox Film Corp., New York.
C. Eichhorn, Vice-President, Local No. 306, New York.

CHAIRMEN OF COMMITTEES

Ways and Means—Otto Kafka, formerly President American Projection Society.
Safety—George Edwards, President American Projection Society.
Projection Room Planning—M. D. O'Brien, Assistant Supervisor of Projection, Loew's, Inc.
Equipment Specifications—J. Hopkins, Assistant Supervisor of Projection, Publix Theatres.
Membership—T. Reed, President Washington Local.
Sound—R. Meihling, Publix Theatres, New York.
History—W. C. Smith, New York.
Law—H. E. Stein, Rialto Theatre, New York.
Lighting and Effects—Colby Harriman, Loew's Palace Theatre, Washington, D. C.
Publicity—P. A. McGuire, New York.
Awards—Thad. Barrows, Metropolitan Theatre, Boston, Mass.
Resolutions—B. Stern, Rialto Theatre, New York.
Public Relations—Harry Sherman, Publix Theatres, New York, formerly Assistant President, I. A. T. S. E. M. P. M. O.

All the officials of the Projection Advisory Council are men of standing in this field, and have been connected with the motion picture industry for many years. The majority of them are noted projectionists who are active in other work, and in the list of Directors and Chairmen of Committees are included manufacturers, business men, lawyers, a member of a State Legislature, graduates of well-known colleges, and officials of various organizations. All of them are ambitious, progressive men who have given much of their own time for the advancement of the motion picture industry.

The chief purpose of the Projection Advisory Council is to conduct a campaign of constructive propaganda and there will be no conflict with the work of any other organization, no duplication of effort. Ignorance and indifference are costly and can only be dispelled through education. A clearer realization of just what good projection means will be of inestimable value to the public and the motion picture industry.

Various agencies and individuals have worked in the past to improve projection conditions, but the efforts of the Projection Advisory Council will be more collective and concentrated. We feel sure that the unified influence is highly necessary in the Projection Department, which has attained a greater importance and become more complex with the tremendous expansion of the motion picture industry.

No attempt will be made to have the Projection Advisory Council comprehensively function at once; each Committee will be given one simple, workable but important task before starting any other activity for the Council. Elaboration of the plans of the Projection Advisory Council will be postponed until, by the successful performance of certain practical but highly essential work, we can gain the confidence of the industry. Accomplishment will be slow, but in the meantime we ask the industry to be patient and to have faith in the men who have associated themselves with the Projection Advisory Council.

The Projection Advisory Council is international in its membership, and all possible care is being taken in the selection of the Directors and Chairmen of Committees. Ideas similar to those upon which the Projection Advisory Council has been founded have been put into successful operation in many other industries, and we see no reason why eaqually satisfactory results cannot be secured by the Projection Advisory Council for the benefit of the motion picture industry.

AMERICAN CINEMATOGRAPHER
1219-20-21-22 Guaranty Bldg.
6331 Hollywood Blvd., Hollywood, Calif.

Gentlemen: Please find enclosed three dollars (foreign rates additional), for one year's subscription to the AMERICAN CINEMATOGRAPHER, to begin with the issue of

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Back to Beginnings

Hollywood's First Introduction to Talking Pictures Was in 1914 When the Kellum System Was Launched

[In its efforts to keep the records straight and place credit for talking pictures where credit is due, THE AMERICAN CINEMATOGRAPHER *herewith reprints an advertisement of "The Major Company," published in the Los Angeles Examiner of May 28, 1914.*

Mr. Kellum, referred to in this ad, is a resident of Hollywood and THE CINEMATOGRAPHER *is informed that his patents were sold sometime ago to one of the large producing companies and that these patents form the basis of one of our best known sound systems. Mr. Kellum perfected his first successful synchronizing system in 1913, here in Hollywood, and this system was first demonstrated in New York City at Town Hall as the feature of the prologue to D. W. Griffith's "Dream Street." The demonstration was hailed as a success. Another interesting chapter on the Kellum System will be published soon in* THE CINEMATOGRAPHER. *—Editor's Note.]*

ADVERTISEMENT
From the Los Angeles Examiner of May 28, 1914.

I am the Major.

I am always in the lead.

My business is to talk to you from the screen of your favorite motion picture house, announcing the pictures, the actors who appear in the picture and the headings for the different scenes.

I am the symbol of the major talking picture, that wonderful new invention by the western wizard, O. E. Kellum, wherein the pictures upon the screen talk in absolute unison and harmony with the actions of the artist.

The Major Film Company controls the patents of the Kellum Talking Picture, wherein lies perfect synchronism. They control the patent also of apparatuses designed to give a full evening's performance without the troublesome, tiresome and aggravating stop for change of either film or talking machine record. The idea of making talking pictures with the use of a device similar to the dictograph concealed about the person of the actor, instead of the actor talking into a horn, is also ours.

Mr. Clune, the owner of Clune's Theatres in the city of Los Angeles and elsewhere, has witnessed a demonstration of this wonderful machine and of his own volition, has written the following letter:

The magnificent new home of Max Factor Products, largest manufactory of make-up materials in America. Their Panchromatic Make-Up has swept both stage and screen and has become internationally famous over night. "Factor's Products—The Greatest Factor in Make-Up."

"Major Film Manufacturing Company,
"806 Security Bldg.,
"Los Angeles, California.
"Gentlemen:—

"I have just been informed that you have acquired the exclusive rights to manufacture and distribute the Kellum Talking Picture.

"Permit me to congratulate you on this acquisition to your company.

"I had the pleasure of seeing it recently and have no hesitancy in saying there is an unlimited field for it, and it will make the moving picture even more popular than at present.

"All human element being eliminated, makes the voice and action absolutely synchronous.

"Wishing you every success, I am,

"Yours truly,

(Signed) "W. H. CLUNE."

The original of this letter and numerous other letters from men whose knowledge of what is what in the Motion Picture Field cannot be questioned, are on file in our office.

We are desirous that just a few people become associated with us in this wonderful profit-making venture. What other companies have done simply manufacturing Motion Pictures, we can do, and added to that possibility we have the additional source of revenue from our TALKING PICTURES.

As soon as the present allotment is sold, the shares will positively advance 50 per cent. This Corporation has behind it tangible assets, approximately 100 acres in Laurel Canyon Heights, and 6 acres in Santa Barbara, both of which places are ideal for the present and prospective work of the company.

The new booklet entitled "Major Talking Pictures," what they are and what they mean to the Motion Picture world, just off the press.

Don't forget that the opportunity of becoming affiliated with a project whose product is vouched for by some of the biggest men in the community and whose officers and directors are successful and prominent business men of your city, is limited.

If you cannot come in, clip the enclosed coupon and we will gladly mail to you our new literature stating in detail the prospects of the company. Come in, if you can, however, and let Mr. Kellum explain his invention to you.

Talk to the President of the company, see our offices and let us make arrangements for a demonstration of this wonderful machine for you. It won't cost you anything unless you are perfectly satisfied. But, be sure and come in as the allotment is limited.

Kindly send me without any obligation on my part your new booklet just off the press, and whatever other authorized literature you have.

Signed...

E. B. DuPar, A. S. C., just recently finished a 100 per cent all talking picture for Warner Brothers and was sent to New York to break in a crew to do Vitaphone at Warner's Brooklyn studio.

The A. S. C. in the Air

Elmer G. Dyer, A. S. C., has just finished the aerial Akeley work on "The Winged Horseman," starring Hoot Gibson, a Universal release. This is a shot of Mr. Dyer showing him in his "ice armour" at his twin Bell & Howell cameras ready to go aloft. The mask is a protection against cold in the high altitudes. Mr. Dyer has had a brilliant career as an aerial cinematographer, very few pictures of this type having been made without his contribution to their photography.

The Mitchell's New Home

Great Business Expansion Forces Local Camera Corporation to Erect Big Plant—$300,000 Investment Involved

The great growth of the Mitchell Camera Corporation since its organization nearly eight years ago is evidenced by the fact that ground was broken at 1 o'clock Monday afternoon, January 21, for a new factory and administration building at 661 Robertson Avenue, Sherman.

The new factory site is about midway between Westwood and Hollywood and convenient to both Hollywood and the rapidly growing production center in the San Fernando Valley. The building, plans for which were drawn by the Truscon Steel Co., will contain 26,000 feet of factory floor space and will be constructed of concrete, steel and glass, absolutely earthquake and fire proof.

The floors will be of sawed wood blocks set in concrete slabs for the comfort of the factory operatives and every possible convenience will be installed. All four walls are set back at least five feet from the property lines, so that there will be no spot in the entire building more than twenty feet from daylight.

The building will front 100 feet on Robertson Avenue and the main factory structure will be 240 feet long and two stories high, with a three-story addition to be erected after the main factory building is occupied and in production. This three-story building will be occupied by the business offices, research department, etc.

Within ninety days from the ground-breaking the factory will be ready for the installation of $50,000.00 worth of absolutely new equipment, including one hundred and twenty electric motors to be used for driving the machines. There will be no line shafts. Every machine will have its individual motor.

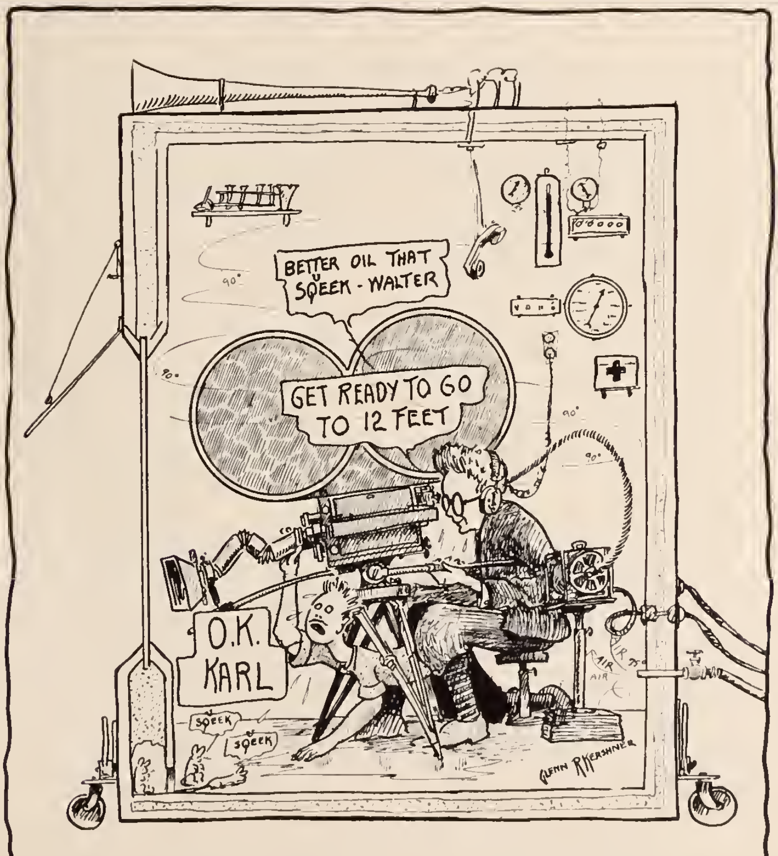
By October 1 all the machinery of the present plant, 6011-6025 Santa Monica Boulevard, will be removed to the new quarters and the consolidated equipment will then represent the largest concern of the kind in the world.

The new building alone, exclusive of the realty, is costing $60,000.00, and the entire investment will aggregate approximately $300,000.00.

The Mitchell Camera Corporation, while devoting its resources to the perfection of its several types of cameras, has not been idle in other directions and, from time to time, news important to the technical side of the industry will be forthcoming from the Robertson Avenue plant, but no announcements will be made until the several products in process of perfection are ready for the market.

Left to right: Dwight Lanning, Fred Yost, Robt. H. Glenn, B. F. Shrympton, John E. Champion, President West Hollywood Chamber of Commerce, Harry Barrett, Secretary West Hollywood Chamber of Commerce. President Hy F. Boeger and Secretary George H. Mitchell, of the Mitchell Camera Corporation, breaking ground for their wonderful new home.

THE AMERICAN CINEMATOGRAPHER and the A. S. C. congratulates the Mitchell Camera Corporation upon attaining this great success in so short a time and bespeak for this wise, far-seeing and enterprising organization even greater success in the years to come. Personal congratulations are extended to President Hy. F. Boeger, president, and George Mitchell and their associates in the invention and development of the Mitchell camera which, within less than a decade, has come into international use.



CROSS SECTION OF CAMERA BOOTH WHILE MAKING A TALKIE PICTURE

PHOTOGRAPHIC EQUIPMENT CLEARING HOUSE

CLASSIFIED ADVERTISING

RATES: *Four cents a word. Minimum charge one dollar per insertion. All copy must be prepaid and must reach us before the fifteenth of the month preceding publication.*

WANTED—MOTION PICTURE CAMERAS

WANTED—For cash, DeBrie, Pathe, Bell & Howell Standard cameras. Send full description. Bass Camera Company, 179 West Madison Street, Chicago.

WANTED—Bell & Howell. Will trade a straight eight convertible coupe. P. O. Box 2151, Station "A", Pasadena, Calif.

WANTED—DeVry 35 mm Camera. Will exchange lenses or 8x10 Ansco Printer. J. R. Lockwood, 1108 N. Lillian Way.

FOR SALE—CAMERAS

FOR SALE—Bell & Howell Camera, 170 degree; three Lenses F 3-5. Late Model Iris with Shade. Mitchell tripod, four magazines, steel cases. Park J. Ries, 1152 N. Western Ave. GRanite 1185.

FOR SALE—Thalhammer Iris, 40 mm, 50mm, 75mm F 3.5. Lenses in B. & H. mounts. Park J. Ries, 1152 N. Western Ave. GRanite 1185.

FOR SALE—One Bell & Howell camera No. 473; one 3.5 Goertz Hypar 32-inch lens; one 3.5 Goertz Hypar 40 mm lens; One Astro F 2.3 2-inch lens. *Hoffner friction free-head with Mitchell legs. Matte box and sun shade fitted to the above. One extra L. A. Motion Picture Co. tripod and head—this can be cut down for a Baby tripod. *Bell & Howell Cinemotor with single action spring switch. Bell & Howell Veedor counter to be used with motor. Bell & Howell Veedor counter to be used without motor. Six magazines, 400-ft. Two magazine cases to carry four each. Thalhiemer matte box sunshade and filter holder. Double rods. Filters. Gauses and miscellaneous equipment. Motion picture diffusion discs. Adjustable filter holder. 3 mm lens for same. Miscellaneous carrying case; camera head carrying case; motor carrying case. This outfit has just been overhauled and inspected and is in A-1 condition. Has not been rented and has had the same operator. $1,350.00. Chas. Boyle, HEmpstead 1128. Have a pair of 3.5,40 mm matched lens, mounted for Akeley camera.

FOR SALE—DeVry Camera No. 2360, complete with leather carrying case and F.3.5. Velostigmat lens. Cash $100.00. Cost new $165.00. Only 1000-feet of film run through. Robert Parker, 6409 Dix Street, Hollywood. HEmpstead 0967.

FOR SALE—Eyemo Camera. F 2.5 Cook lens, 6 spools and carrying case; in fine mechanical condition; cost new $275. For quick sale, $150.00. Frank Cotner, HOllywood 5046.

FOR SALE—Bell & Howell Camera No. 597.—2-in. Contrast Astro F.2.3,—40 mm. Contrast Astro F.2.3,—35 mm. Zeiss Tessar F.3.5,—3-in. Goerz Hypar F.3.5.—Large Mitchell Finder, Mitchell Tripod and Tripod Head; Thalhammer mat box with complete kits; 4 magazines. $1500.00. Ira B. Hoke, GRanite 5033, or care of A. S. C. office.

FOR SALE—Bell & Howell Cameras, fully equipped. 50 mm Astro 2.3; 75 mm Cooke 2.5; 40 mm Goerz 3.5; 50 mm Goerz 3.5; 75 mm Carl Zeiss 3.5. Bell & Howell Tripod, Mitchell legs, Baby Tripod. Complete equipment. Call 599-239. Dr. G. Floyd Jackman.

FOR SALE—MISCELLANEOUS

FOR SALE OR TRADE—1 F 1.8 two-inch Astro lens. Will fit B. & H. or Mitchell standard mount. 1 F 2 two-inch Cooke lens. 1 40 mm Carl Zeiss lens F 2.7. 1 F 1.9 two-inch Minor lens. 1 three-inch Graf lens, soft focus. 1 two-inch Graf lens, soft focus. Joseph Walker, 8268 Sunset Blvd. Phone Crestview 6350.

FOR SALE—Eight 400-ft. Mitchell magazines; 2 cases for same. One Eyemo camera. All in good condition. Call Pliny Horne, 1318 N. Stanley Ave., Hollywood. Phone HO-7682 or WEstmore 1271.

FOR SALE—Two slightly used Mitchell Matt boxes at $40.00 per set. Call Chas. Glouner at Universal Studios. HEmpstead 3131.

FOR SALE—Bell & Howell quick release Tripod with L. A. rock steady head, for Bell & Howell Camera. And one regular tripod, both good shape. Also six-inch Bosch & Lomb lens mounted. Call B. B. Ray, Richter Photo Service, 7764 Santa Monica Blvd., Telephone HOllywood 9750.

FOR SALE—One 3-inch Astro Lens, F.1.8. One 2-inch Graff Variable Focus Lens. Both in Mitchell Mounts. J. R. Lockwood, 1108 N. Lillian Way. GRanite 3177.

FOR SALE—Four 400-ft. Mitchell Magazines with case; also one 8x10 Ansco Printer, practically new. J. R. Lockwood, 1108 N. Lillian Way. Granite 3177.

FOR RENT—CAMERAS

FOR RENT—SALE—Bell & Howell camera complete with all new 2.3. Astro lenses; Mitchell legs; large erect new Mitchell Finder; built-in side prisms, baby tripod, matt box, etc. Cash, or will rent applying fifty per cent for payment on camera. Bernard B. Ray, Richter Photo Service, HO-9750. 7764 Santa Monica Blvd.

FOR RENT—One brand new silent Mitchell camera. Speed movement; 1000-ft. magazine; fully equipped. Available February 1st. Call Richter Photo Service, 7764 Santa Monica Blvd. Phone HO-9750, or B. B. Ray, WHitney 4062.

FOR RENT—Two Mitchell Speed Cameras, No. 85, 7 No. 97, with Astro Lenses; extra Mitchell magazines, Mitchell high speed gear box and cable, Mitchell motors. Call Pliny Horne, 1318 N. Stanley Ave., HOllywood 7682 or A.S.C. GRanite 4274.

FOR RENT—Two Bell & Howell cameras, Mitchell tripods, large finders, all F/2.3 lenses. Also Cinemotor and friction head for Akeley work. Frank Cotner, 6273 Selma Ave., HOlly 5046.

FOR RENT—170 deg. Bell & Howell, 3" F 1.9 Dallmeyer, 3" F 3.5 Goerz, 2" F 2.3 Astro; 40 m.m. F 3.5 Goerz, Mitchell tripod with Bell & Howell head, baby tripod, six magazines and prism. Call TErrace 9152.

FOR RENT—Four Bell & Howell Cameras, one cinemotor and friction head for Bell & Howell; 2.3 Astro lens, large Prismatic Mitchell finders and Mitchell legs. Special built-in side Prisms. Baby tripod, extra tripod; six inch lens in mount. Richter Photo Service, 7764 Santa Monica Blvd., HO-9750; at night HE-1780, or B. B. Ray, WH-4062.

FOR RENT—To reliable party, one Bell & Howell camera with Mitchell legs; Astro Lens F. 2.3., Fl. 8. 6 magazines. Fred Hoefner mat box. In perfect shape and fully equipped. Joe LaShelle. ORegon 6730.

BELL & HOWELL, 170, with 30, 40, 50 and 75 lens equipment. Baby tripod. Also B. & H. Cine motor. Charles Stumar. GRanite 9845. 7501 Lexington Ave., Hollywood.

FOR RENT—Two Mitchell Cameras fitted with speed movements. One Mitchell Camera with regular movement. All with Astro 1.8 and 2.3 Lenses. One Mitchell Motor and One Mitchell Freehead. J. R. Lockwood, 1108 N. Lillian Way. GRanite 3177. Residence 523 N. Orange St., Glendale. Phone Douglas 3361W.

FOR RENT—Two Bell & Howell Cameras, Astro Lenses, Mitchell Tripods and large finders. J. R. Lockwood, 1108 N. Lillian Way. GRanite 3177.

FOR RENT—Eight Bell & Howell cameras, fast lenses, large finders, Mitchell tripods. Park J. Ries, 1152 N. Western Ave. GR-1185.

FOR RENT—Akeley camera outfit, Mitchell tripod, 6 magazines, equipped up to 6 inch lenses. Park J. Ries, 1152 N. Western Ave. GRanite 1185.

FOR RENT—Two Bell & Howell Cameras, equipped with Speed movements for slow motion or sound work, fast lenses, large finders, Mitchell tripods, 1000-ft. magazines. Park J. Ries, 1152 N. Western Ave. GRanite 1185.

FOR RENT—MISCELLANEOUS

FOR RENT—Mitchell Gear Box with shaft and crank; also Bell & Howell gear box with clamp, flexible shaft and crank. Alvin V. Knechtel, 1179 N. Kenmore Ave. Phone OLympia 9950 or GLadstone 4111, Extension 321.

FOR RENT—One Mitchell Motor, latest type. One Mitchell Friction Tilthead. J. R. Lockwood, 1108 N. Lillian Way. GRanite 3177.

FOR RENT—One Cinemotor with Veeder counter in first class condition. Baby tripod; extra tripod. Mitchell friction heads for Bell & Howell camera. Six inch lens in mount. Richter Photo Service, 7764 Santa Monica Blvd., HO-9750; at night HE-1780.

FOR RENT—Mitchell Gear Box with crank and shaft. 12-inch Dallmeyer lens mounted for Mitchell or Bell & Howell with special Long focus view finder. Donald B. Keyes, HOllywood 1931.

FOR RENT—STILL CAMERAS

FOR RENT 1 8x10 Still Camera, focal plane shutter, complete, 1 Mitchell Friction Tripod, new, for B. & H. 1 Eyemo Camera with special lock. 1 4x5 Graflex B. & L. lens. 1 B.-H. Low Boy to fit new style B.-H. Tripod head. Joe LaShelle, 639 N. Sierra Bonita, ORegon 6730.

FOR SALE—LENSES

FOR SALE—50 m.m. Goerz Hyper lens F. 3.5 in B. & H. mount, $25. 50 m.m. B. & L. lens F. 2.7 in B. & H. mount, $45. J. N. Giridlian. Phone TErrace 9152.

FOR SALE—One six-inch 4.5 Zeiss Tessar Lens. Price $50.00. John Silver, 2076 Mound St., Hollywood, Cal. Phone HO-8607.

THE A.S.C.

Complete Roster at Date of Publication, January 25, 1929

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Breaking Ground for the New Home of the Mitchell Camera Corporation, January 21, 1929

Ian Keith

AMERICAN CINEMATOGRAPHER

A technical and educational publication, espousing progress and art in motion picture photography.

Suite 1222 Guaranty Bldg. - - - - Hollywood, California

Vol. X

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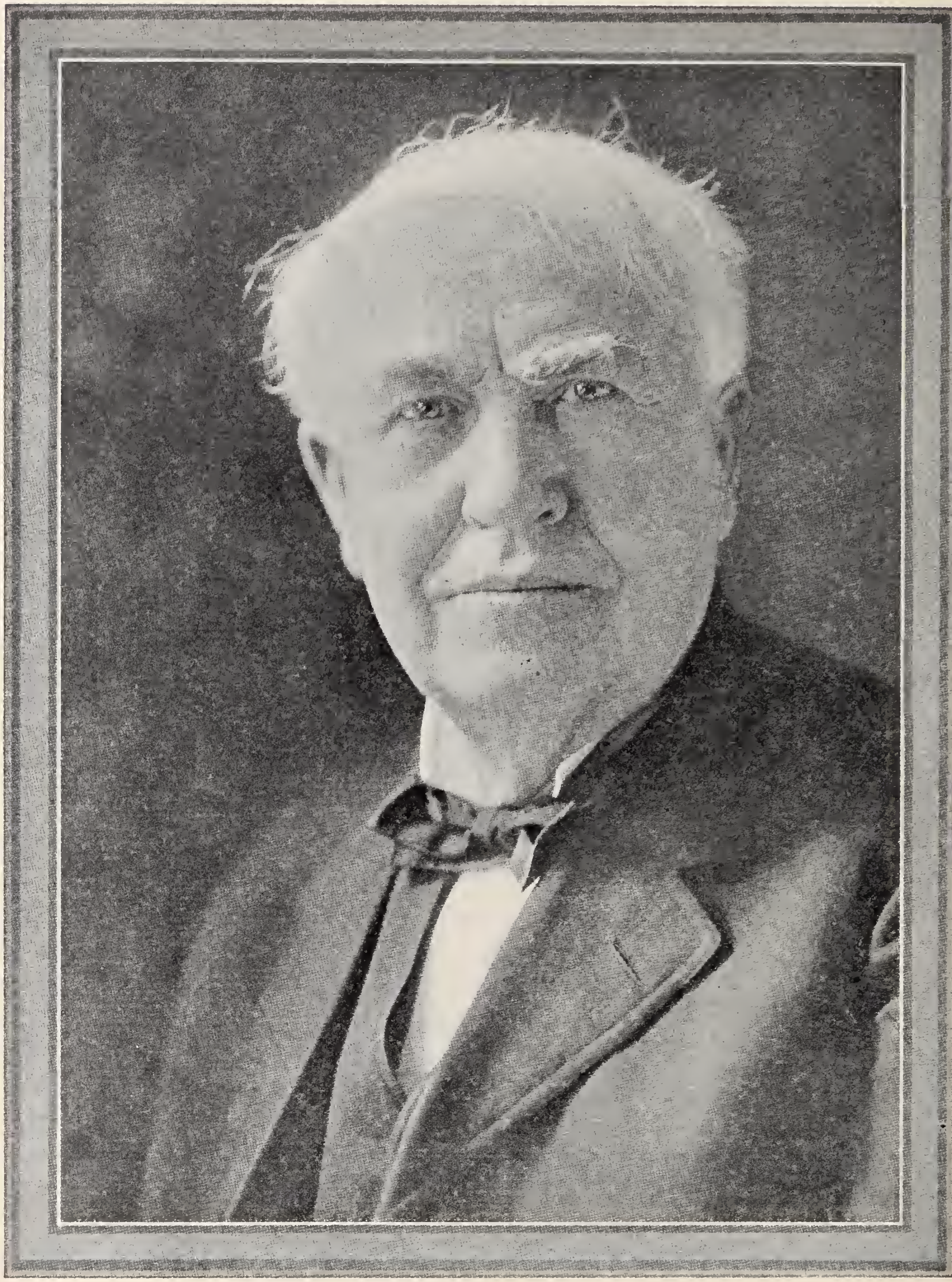
No. 2

Published Monthly by THE AMERICAN SOCIETY OF CINEMATOGRAPHERS, INC., Hollywood, Calif. Established 1918. Advertising Rates on Application. Subscription: United States, $3.00 a year; Canada, $3.50 a year; Foreign, $4.00 a year; single copies 25c. Telephone GRanite 4274.



WHAT a twilight hour must be his in the knowledge that as daylight fades, millions of his lamps take up the vigil, forming the western boundary of a zone of man-made light, following in the wake of the sun as it encircles the globe and spreading half way 'round the world to meet its return in the east.

The Golden Age of Light Salutes its Founder

In this year, 1929, the nation and the world are called to celebrate the genius of Thomas A. Edison for fifty years of incandescent lighting

By Dr. Charles A. Eaton

This unusually interesting article by Dr. Eaton is reprinted from LIGHT, the very excellent magazine published by the National Lamp Works, Nela Park, Cleveland, Ohio, through the courtesy of its board of editors.—Editor's Note.

ON FEBRUARY 11, in 1847, at Milan, Ohio, Thomas A. Edison was born. On February 11, 1929, at Miami, Florida, this same Thomas A. Edison celebrated his eighty-second birthday, and a world paid its respects. This was only the start of a fitting celebration.

On October 21, 1879, just half a century ago, he invented the first practical incandescent lamp. The light we know today was born. Already in some quarters the quavering flame that has served man since he emerged from his cave is known only as a curious relic of other days. And this year, light, the light we know, enters upon its golden jubilee. The golden wedding of an envisioned dream with stolid fact will be celebrated. For fifty years now these two have gone hand in hand and the world is immeasurably enriched by their union.

To enumerate the principal accomplishments of this wonderful life would be to catalog much that every schoolboy knows. To appreciate their full significance challenges even the most adaptive imagination.

He has trapped and preserved for us beautiful sense impressions. He has banished night. He has spanned by means of thread-like, yet powerful, bridges, taut and quivering between their airy supports and humming through the frosty night, the space that separates the rushing waterfall from the homekeeper who needs its power. In a thousand ingenious ways he touches our lives at every turn.

Yet, fortunately, the eulogy we voice is not an obituary. Antony of old paid glowing tribute to a departed Cæsar, reminding his hearers of enriching conquests that had been made. He reminded them of their indebtedness to Cæsar by reading his will wherein the populace was bequeathed a share in the use of his estates. Today, we pay tribute to a living Cæsar —one who has wrested from the forces of darkness and drudgery a freedom in which all mankind participates. And while we are already enjoying that rich legacy, he is still busy unearthing new treasures. Our children's children will speak with reverence of the Edison it has been our privilege to know and appreciate during our own life span. Such a Cæsar need fear no Ides of March.

Would you be reminded of your personal indebtedness to Edison? Then take thought of every commonplace thing you do today in a way that is better and more efficient than the way in which your grandfathers did it. Trace back to its origin the modern way of doing it. And you reconstruct the road down which we have traveled—sometimes all too careless about preserving bridges behind us—and then travel over this reconstructed highway, sooner or later you will find yourself in the vicinity of Menlo Park or even a boyhood laboratory in Northern Ohio. What is commonplace today was little short of miraculous fifty years ago. It remained for a genius too big to slip into conventional grooves to bring such things about. Does such a train of thought prompt you to want to take an individual and personal part in "the greatest living tribute" to be paid this man?

No more fitting time could be chosen to honor Edison than that period lying between the date just passed, marking his eighty-second birthday, and October 21st, marking the fiftieth anniversary of the invention of his lamp. Every man, woman and child should have a part in it. But above all that industry which has become a colossal giant of service sprung from the hand and brain of this single man, will want to take a principal part in it. It is the golden jubilee of light. It is also the golden jubilee of the industry of which we are a part. Light is its appropriate agency of expression. Let the golden shafts of Light the Militant be directed triumphant against the crowding forces of darkness. Let the gentle aura of Light the Beautiful crown the temples of industry and commerce that man's ingenuity has reared. Let

The progenitor of the Age of Light developed in Edison's laboratory in 1879.

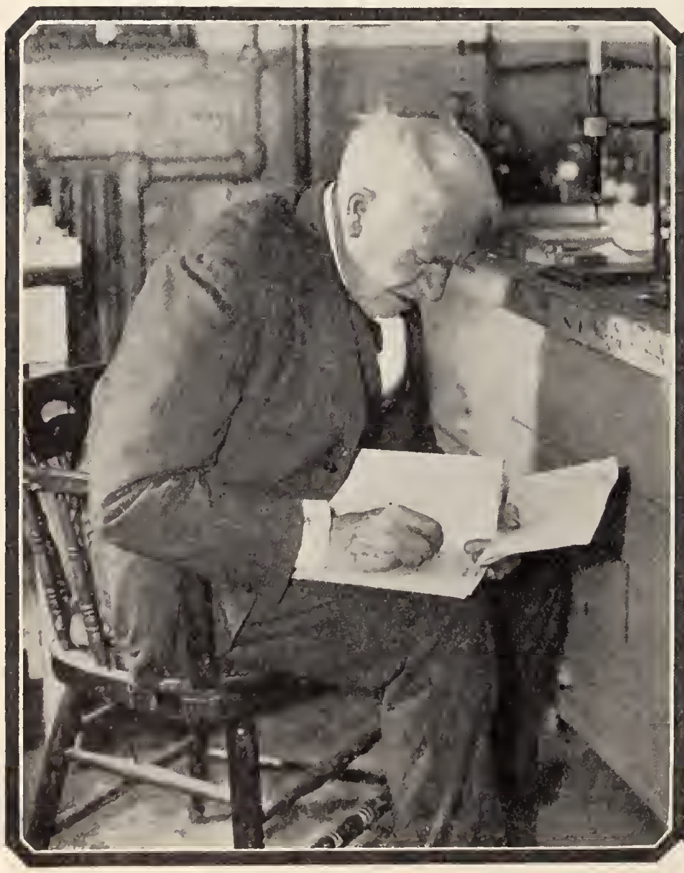
the spirit of Light the Benign and Helpful enter alike into mansion and hovel, into magnificent cathedral and lowly mission, into the humble wayside forge and into the steaming, clanking enclosures where leviathans of steel place at man's fingertip a thousand horses impatient to respond to his wish. Let it enter there and wherever man walks, worships, or works, unhindered in its ministering needs. Let its flaming symbolism be flung aloft where it will touch the spiritual needs of man as it has ministered to his more practical needs, quickening his pulse even as it has enlivened the tempo of his daily tasks. Let light be glorified as it never was before. This will be a fitting celebration.

This modest dwelling on a quiet street in the village of Milan, Ohio, has become one of the famous shrines of the civilized world. It receives particular homage from Americans since it was here that their great fellow citizen, Thomas A. Edison, was born.

But let us not think too objectively of this celebration. It will be a wonderful tribute to a wonderful man. Subjectively it will be a wonderful thing for individuals who take a part in it and all who witness it. We need heroes to lift us above the sordid and to quicken within us the urge of neglected and forgotten ambitions. We need the practical idealism that comes from knowing a life unswervingly devoted to a high purpose. Modern "disillusions" are forced into a background by contemplation of a life so rich in the old-fashioned virtues.

Heroes we have had aplenty of the swashbuckling sort. Our printed histories show a tracery of man's conquest of man, the carving out of the destinies of nations by the sword. Generals and admirals of time-dimmed periods furnish a stimulus for our instinct to excel on the field of combat. All the great sagas of romance and adventure have from childhood thrilled us and spurred us to visualize ourselves as heroes of daring exploits. We ourselves are largely the creatures of the heroes of our younger days. But what man of any period has loomed so high above his fellows in his field of human endeavor as has Thomas Edison? Here is a hero from the world of work.

When will the mass of men learn that there is no joy worthy the name except in work—accomplishment? Idleness is merely the mirage that beckons with its illusions



The greatest living American has found work a tonic force. It has stimulated him to wonderful inventions and has preserved the vigor of his mind through advancing years.

The world's richest man, Henry Ford, has a hero—the world's greatest inventor of all times. Here we see them in a whimsical pose which bespeaks their close friendship.

the man who has not found his work or found himself in his work—contentment with leisure, a thing to be enjoyed only in the evening of a day or life well spent. Young America needs a hero whose way of living will emphasize these things, middle-aged America needs to take inventory of its heroes to be stimulated to big deeds yet to be accomplished. Look to the life of Edison. In this way we will learn a new philosophy of work and service.

Menlo Park, the birthplace of the first incandescent lamp, has become the central part of a great museum of Edisonia, which Henry Ford has collected at Dearborn, Michigan.

Study this life from its humble beginnings. Learn the lesson of perseverance and directed effort it teaches. See how achievement followed achievement in rapid succession and deduce your own principles. We are paying a moral tribute to a man, but as with all true service the giving leaves us the richer for having given.

He gave us many conveniences. Above all he gave us light. What a twilight hour must be his in the knowledge that as daylight fades millions of his lamps take up the vigil, forming the western boundary of a zone of man-made light, followed in the wake of the sun as it encircles the globe and spreading half way 'round the world to meet its return in the east.

* * * *

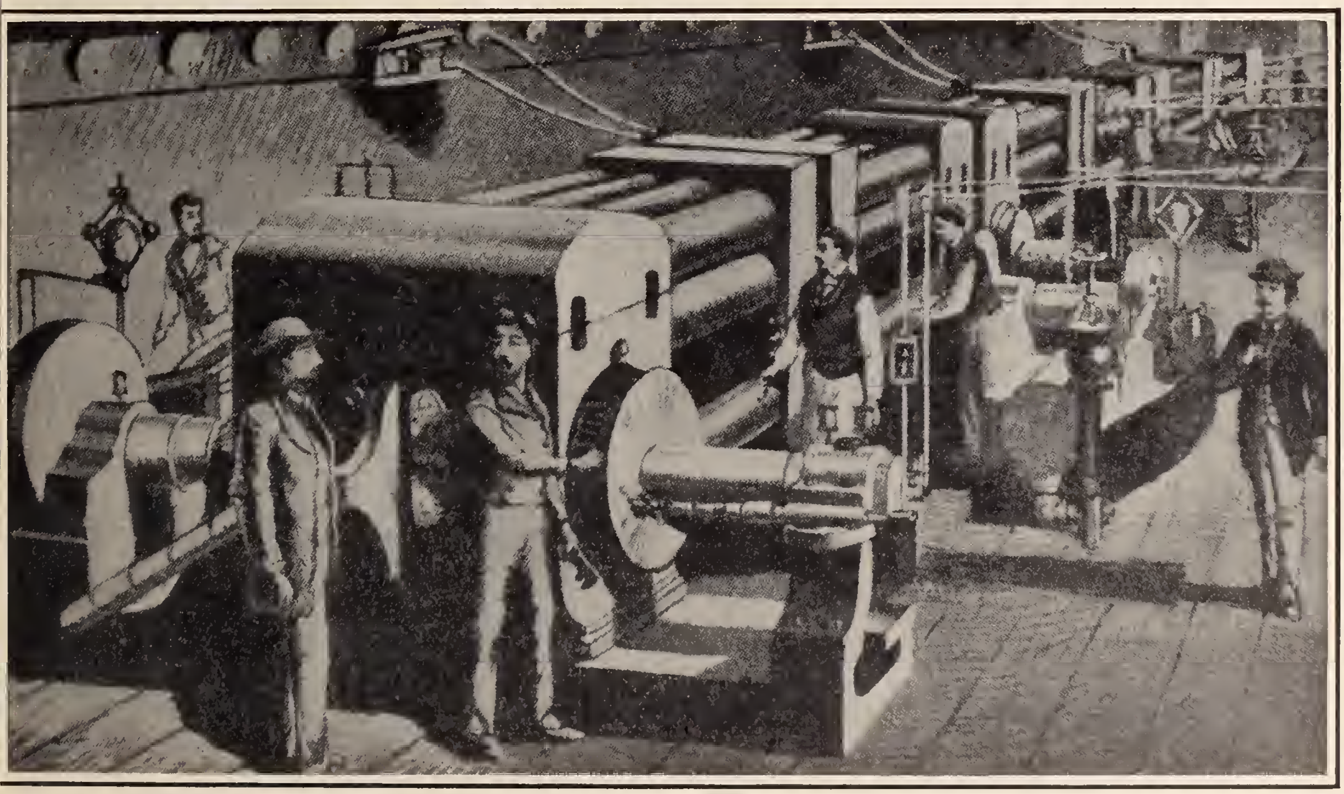
The Edison Pioneers at the annual meeting held February eleventh at the Hotel Astor, to celebrate the eighty-second birthday of Thomas Edison, unanimously approved the suggestion of a world-wide celebration to be held to honor the fiftieth anniversary of the invention of a practical incandescent lamp by Mr. Edison.

It was also announced that the celebration would culminate in a great national tribute on October 21, 1929, the date which marks the fiftieth anniversary of the production of the first incandescent lamp. The plan for the celebration was tentatively outlined in a speech by John W. Lieb, senior vice-president of the New York Edison Company and member of the executive committee of the Edison Pioneers.

Mr. Lieb said in part:

"In 1879, Thomas Alva Edison gave to the world the first practical incandescent lamp which forever freed our vision from the bondage of darkness. This year we celebrate the fiftieth anniversary of that great event and it is appropriate that that celebration take the form of a tribute to Thomas Alva Edison which is in some manner worthy to the Great Master and his outstanding achievement.

"No mind in modern times has touched at so many points the lives of so many people and so profoundly affected the welfare of mankind as Mr. Edison."



The Golden Age of Light began with the invention of the incandescent lamp. Concurrent with this invention, however, was Edison's complete development of a central station which clinched the success of the lamp. Here is shown the original central power station at Pearl street, New York City.

A New Editor Takes the Reins

With this issue of The American Cinematographer *we find a new man in the chair as Editor of the magazine and general manager of the American Society of Cinematographers. He is Hal Hall, a man of wide experience in the newspaper, magazine and motion picture fields.*

Mr. Hall takes the place of Mr. Silas Edgar Snyder, who has been in the editorial chair of The American Cinematographer *for the past year and a half.*

In leaving the Society Mr. Snyder takes with him the kindliest feeling of appreciation of the entire membership of the A. S. C., who wish him continued success in his new duties.

In securing Mr. Hall as editor, the Society feels particularly fortunate as his past experience cannot but be of infinite value to the society and the magazine. As a magazine writer, newspaper reporter, feature writer and editor, and in various phases of the motion picture field Mr. Hall has long proven his ability.

The new editor plans many changes in the makeup of the magazine—all of which the Society feels will make The American Cinematographer *of still greater value and benefit to the motion picture industry. The same high quality of technical articles will not only be maintained, but will be improved. In addition, an amateur department, spoken of elsewhere in this issue, is to be added, and a more human touch will be found in stories and articles of particularly human appeal.*

In short, the Society believes that The American Cinematographer, *under the guiding hand of Mr. Hall, is destined to become still more outstanding in the cinematographic and technical field than ever before.*

(*Signed*) John F. Seitz,
President, A. S. C.

Introducing the Amateur Dept.

For ten years the American Cinematographer has served the professional artists of the motion picture world, and has, in the opinion of the greatest minds of the cinematographic field, been THE outstanding magazine devoted to the advancement of cinematography.

Throughout these years this magazine has not only kept abreast of the times, but has usually been a step ahead.

Now, because of the increased demand for cinematographic knowledge, the magazine is widening its scope to include the vast field of the Amateur *cinematographer.*

Beginning with this issue, an amateur department comes into being. And in inaugurating this department we feel that we are offering something to the amateur which no other magazine can offer. This something is a service department: a question and answer department in which the amateur may have his problems solved by the master cinematographers whose skill and genius have placed American made motion pictures at the top of the world's motion picture ladder.

Hardly a day but what the amateur runs up against a problem. Lighting, camera angles, lens questions, how to obtain best results on a cloudy day or a day when a glaring sun beats down. What type of lamp should be used for photographing in the kitchen or the attic. Thousands of questions arise and the amateur has to turn to those in many cases who obtain their information from a book.

The American Cinematographer, the official publication of the American Society of Cinematographers, will answer these questions and solve these problems for its amateur subscribers. And the answers will be from the men who daily are photographing such stars as Mary Pickford, Doug Fairbanks, Ronald Colman, John Barrymore, Harold Lloyd, Al Jolson and the like. The problems will be solved for our amateurs by men who have photographed such pictures as "Noah's Ark," "The Broadway Melody," "Seventh Heaven," "Lady of the Pavements," and others.

"Talkies" by amateurs are now being made, and with this new development among the amateur ranks the problems will increase.

The entire membership of the American Society of Cinematographers will furnish the practical, professional knowledge and aid to our amateur subscribers. There is no other magazine that can offer such a service.

In addition to the question and answer department there will be articles of help and interest every month by men who know cinematography.

So, write in your problems to the editor of The American Cinematographer *and receive really authentic answers. We aim to be of as much assistance to the amateur as we have been to the professional. The first page of questions and answers will appear in the June issue.*— [The Editor.]

The Why and Wherefore of the Mazda Lamp

By L. C. Porter

Engineering Dept. Edison Lamp Works, Harrison, N. J.

MY GOOD friend, The Editor, has asked me to write something for The American Cinematographer, and has even gone so far as to suggest that I choose my own subject—a very dangerous suggestion. Under such conditions one is likely to write about something that interests him immensely and usually that interest is due to lack of full and accurate knowledge of the subject.

Perhaps it is for that reason that I find the American Cinematographer such a fascinating magazine. It has an individuality that makes it somehow different from the general run of technical publications, and I enjoy reading it regularly.

L. C. Porter

I gather from the columns of this magazine that interest in Mazda lamps still continues in Hollywood. If this is so it might not be out of place to review a few of the fundamental characteristics of Mazda lamps and the principles of their most efficient utilization.

The Mazda lamps of today convert electrical energy into light in exactly the same fundamental manner as the original incandescent lamps invented by Thomas A. Edison in 1879, i. e., by passing an electric current through a filament having sufficient resistance to cause the electricity to heat it to incandescence. True, the tungsten filament gas-filled lamp of today is vastly more efficient than Edison's first carbon filament vacuum lamp. Some of the large Mazda lamps consuming ten thousand watts, that are used for motion picture studio lighting, produce 26 lumens of light for every watt of power consumed; whereas Edison's first lamp had an efficiency of only 1.7 lumens per watt. Even with this great improvement the most efficient lamps today are at best very inefficient producers of light. Of the total amount of electrical energy that goes into the lamp only about eight per cent comes out as light, the rest is converted into heat. There is, therefore, still considerable opportunity for research and development along the lines of producing a better illuminant.

It makes little difference, as far as light emission goes, whether a piece of metal is heated in a gas flame, in a coal stove, or by passing an electric current through it. After it reaches a certain temperature it begins to glow. That is commonly called "red hot." As the temperature increases the glow gets brighter and brighter until pretty soon it reaches the point called "white hot." These peculiar terms result from the fact that there is an actual color change as the temperature increases. Exactly the same thing happens with a lamp filament; operated at low temperature it emits light of a rather orange or yellow hue, as it gets hotter this color gradually becomes more and more nearly white.

The principal difference between heating a metal wire in a gas flame or in a lamp bulb from which the air has been exhausted is that in the former case the oxygen of the air will combine with the hot metal and soon cause it to burn up, whereas in the lamp bulb the metal wire or filament will continue to glow for a long time without burning up or "out," as they generally say when a lamp fails.

A lamp will not last indefinitely because, in spite of the fact that all of the air has been removed from the bulb, the surface of the filament gradually vaporizes at high temperature, causing the filament to become thinner and thinner until it finally burns in two. The higher the temperature at which the filament is operated the more rapid is the disintegration.

In the higher wattage lamps this disintegration is retarded by filling the bulb with an inert gas after the air has been pumped out. By this means the gas-filled or Mazda C lamps can be made either longer life than the vacuum or Mazda B lamps for the same light output, or what is more important, they can be operated at a higher temperature and thus emit more light for the same life, i. e., they are more efficient lamps.

In addition to emitting a whiter light as the filament temperature is increased, the relative amount of energy converted into light also increases. It is, therefore, obviously a great advantage to operate lamp filaments at high temperatures. We have, however, already seen that the higher the temperature, the more rapid the disintegration, and hence the shorter the life of the filament. The limit, of course, is the temperature at which the filament material actually melts. For tungsten this is approximately 3,475 degrees Centigrade.

In designing a lamp, therefore, we must compromise between life and light. We can secure more light at the sacrifice of life and vice versa. In general, the life of Mazda lamps is set at such a value as to produce light most economically for the service for which the lamp is intended, i. e., considering the cost of lamp renewals and the cost of current consumed by the lamps.

For general home, office, and store lighting this calls for an average life of 1,000 hours. For street railway service 1,500 hour lamps are used; for flood lighting service 800 hours, for spotlight work 200 hours; for automobile headlights 100 hours; and for projection service such as in stereopticon and motion picture projectors, 50 hours.

In some of these services, factors other than cost of current and cost of lamps also have a bearing on the design life. Take for example, a lecturer showing slides or motion pictures before a large audience. There the most essential thing is to show a good brilliant picture on the screen. The optical system of the projector limits the wattage or size of lamps that can be used. It is, therefore, necessary to operate such lamps at very high brilliancy or efficiency to secure adequate screen illumination. This inevitably means short life. Hence, the 50-hour design for the projection lamps.

In speaking of lamp life we always speak of the average life of a group of lamps, and not individual lamp life. That is because there are inherent variations in individual lamps which cause one to vary slightly from another. If we take a typical group of new lamps and start them all burning at the same time perhaps two or three of them will burn out or fail before reaching 30 per cent of their rated or average life; 5 per cent of the lamps will probably have failed by 50 per cent life; 20 per cent by 75 per cent life, and nearly 50 per cent of them will have given up the ghost before passing 100 per cent of their rated life. The remaining 50 per cent will live well beyond their normal life. Approximately 25 per cent of the original lot of lamps will still be burning at 125 per cent life; 10 per cent at 150 per cent life, and perhaps one or two at 200 per cent life. The average of the entire lot, however, will be very close to their rated life.

We have seen that life is dependent upon filament temperature. That in turn depends directly upon the voltage of the circuit on which the lamps are burned. Lamps are designed for use on various voltages, such, for example, as 110, 115 or 120, and are so labelled. Any departure from the labelled voltage has a very marked

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Factors Which Affect the Contrast of a Lens Image

By Clifton Tuttle and H. E. White

(Communication No. 329, from the Kodak Research Laboratories. An S. M. P. E. Transaction.)

THE accurate reproduction of object contrast by the lens image is the optical desideratum in photography. To fulfil this requirement it is necessary that each area in the image shall receive light only from the corresponding area of the object. If any light other than true image-forming light falls onto the image, the contrast relations will be altered. A uniform distribution of non-image forming light over the image results in a decrease of image contrast.

In practice several factors may give rise to the presence of extraneous light: light leaks in the camera, lens flare (i. e., reflections at glass-air surfaces of the lens), reflections at metallic surfaces of diaphragm, lens mounting and camera interior, and diffusion due to foreign particles within the glass and on the surface. The first of these is avoidable by proper construction of the camera and by care in its use. The second it is impossible to avoid entirely, though by careful design of the objective its effect may be minimized. The third factor is more difficult to control and of greater magnitude than is generally supposed, but by proper precautions its effect may be reduced to negligible proportions. The fourth factor is dependent principally upon the cleanness of the lens.

Lens Flare

The effect of lens flare upon the image contrast is small in properly designed motion picture lenses containing not more than three components. Though it may be measurable under laboratory conditions, for the great majority of practical cases it need not be considered as a serious menace to image quality. The conditions causing flare are shown in Fig. 1. It illustrates a simple lens which is forming an image of a distant object in the plane I. Light from the object is incident at the surface A. A portion (about 4 per cent) is reflected at this surface in the direction of the object. The remainder, except a very small amount lost by absorption, passes through to surface B, where a second reflection takes place. This second reflected component returning in the direction of the object suffers another reflection at surface A. The light resulting from a secondary reflection at surface A amounting to about four per cent of four per cent, or 1/625 of the original, goes to form the primary flare image at F. The image F may lie at any position with respect to I, either in front of or behind it, depending upon the curvatures of the lens surfaces and upon the refractive index of the glass. If it lies in the same plane as the image I, a flare spot results and the contrast of the image of this part of the object may be considerably affected. If it lies either close to the lens or far behind it, the flare light will be fairly well distributed over the image area. In either of these cases of uniform distribution, the maximum effect upon contrast may be computed, for at the most, 1/625 of the average image brightness will be added to the brightness of each portion of the image.

Suppose that the highest brightness of the object measures 8,000 millilamberts and that of the shadow portion is 100 millilamberts. The object contrast will be 80. If a single lens with an F 8 aperture is used, the image brightness due to true image-forming light will be about 1/100 of the object brightness; 80 and 1, respectively, for highlight and shadow. To each of these values will be added about 1/625 of the average image brightness. The average image brightness depends upon the type of picture. In seascapes or snow scenes containing a great deal of sky, the average image brightness may be nearly as great as the highlight brightness. For the usual case, however, the average will be not over twenty-five per cent of the highlight value. If an average brightness of 20 millilamberts is assumed for the foregoing case, 20/625 millilamberts will be added to image highlight and shadow. The contrast ratio then becomes 80.032/1.032=77.5. Here it is assumed that all of the flare image strikes the true image, hence the effect upon the contrast computed above will be a maximum for the assumed condition of uniform distribution. If the flare light is distributed throughout a wider angle than that subtended by the real image, as is usually the case with a well designed objective, the contrast reduction will be less.

A fairly accurate estimate of the maximum flare effect of any number of lens elements can be computed by assuming a pile of plane parallel plates separated by air instead of a number of curved surface elements with intervening air spaces. It can be shown that:

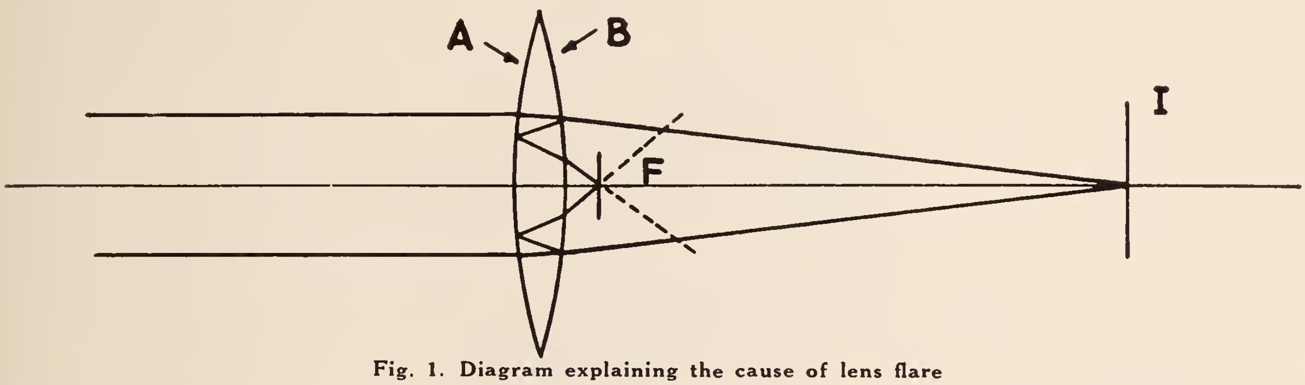


Fig. 1. Diagram explaining the cause of lens flare

$$* \quad \frac{I_r}{I} = r^2 \left\{ 1 + \frac{1}{1-t^2} \left[2(n-1) - \frac{t^4(1-t^4(n-1))}{1-t^2} \right] \right\}$$

where I_r= light transmitted after two surface reflections

I=directly transmitted light

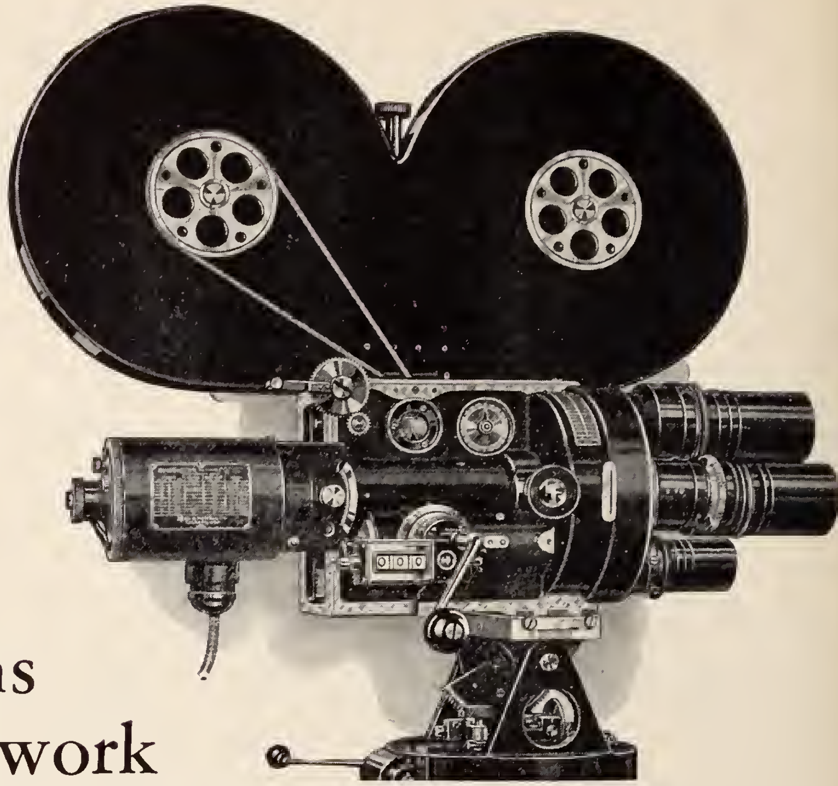
$r = \left(\frac{u-1}{u+1}\right)^2$=Fresnel reflection co-efficient (u—refractive index)

$t = \frac{4u}{(u+1)^2}$=transmission co-efficient

n=number of plates

Substituting in this formula for various numbers of plates and assuming a refractive index of 1.5 gives the results in Table 1.**

Bell & Howell Professional Standard Camera



BELL & HOWELL

Silent Standard Cameras

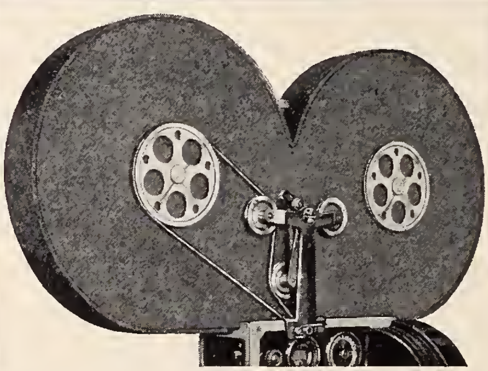
need no booths for sound work

FULL camera freedom can be enjoyed in sound work by using Bell & Howell Sound Recording Cameras. The precision for which Bell & Howell products have been noted during twenty-two years of camera building, has produced sound recording equipment that completely eliminates all mechanical sounds.

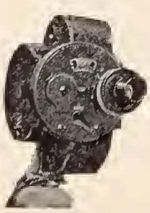
These cameras are frequently placed within eight or ten feet of the subject *without needing the protection of an interfering camera booth!*

Silencing of the camera mechanism has been accomplished by replacing steel gears with fibre gears where necessary, by the use of solid bronze bearings and by the elimination of all lost motion. Camera interiors and shutter blades have also been dampened by sound absorbing felt linings. A further feature of Bell & Howell sound recording equipment is the Sound-Proof Magazine with Silent Belt Tightener. An endless fabric belt is automatically kept at a proper tension for the uniform take-up of exposed film on rolls of any size. Complete silence of the magazines is assured by a number of holes drilled in the back and cover to interrupt sound waves, and by a complete outside covering of quarter-inch sponge rubber.

These details indicate the care with which Bell & Howell engineers have met the conditions necessary to produce sound pictures without limiting the mobility of the camera. Consultations are invited on Sound Recording Installations.



Bell & Howell 1000 ft. Sound-Proof Magazine with Silent Belt Tightener.



BELL & HOWELL CO.

Dept. E, 1805 Larchmont Ave., Chicago, Illinois

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Table 1.—Ratio of re-reflected light to total transmitted light for various number of plates.

n	F=IR/I
1	.0016
2	.0093
3	.021

*This formula assumes normal incidence and neglects reflected light of higher orders and optical absorption within the glasses.

**Goldberg ("Der Aufbau des Photographischen Bildes,") Enzyklopadie der Photographie (Vol. 99), has found experimentally a value considerably in excess of these computed maximums. Goldberg expressed the flare-forming characteristics of a lens as "Specific Brilliancy," which he defines as $\log_{10} I_s/I_r$. I_r and I_s under the described conditions of the experiment seems to correspond to our value IR and I, respectively. Stating Goldberg's value of Specific Brilliancy in terms of our value F, as used above, his data give:

N	Specific Brilliancy	F (computed)
1	2.2	.0063
2	1.8	.016
3	1.5	.032

Apparently in the case of the objectives measured by Goldberg, either the flare light was concentrated about the area measured or there were present internal reflections other than those at glass air surfaces.

Non-Image Forming Light Due to Internal Reflection Other Than Lens Flare

If the lens of the motion picture camera is unprotected by a hood or lens shade of some kind, light other than that used to project the image on the gate will enter the lens. Even if the barrel and diaphragm and the interior of the camera are carefully blackened, some portion of this unnecessary light will eventually—perhaps after several reflections—fall on the film aperture.

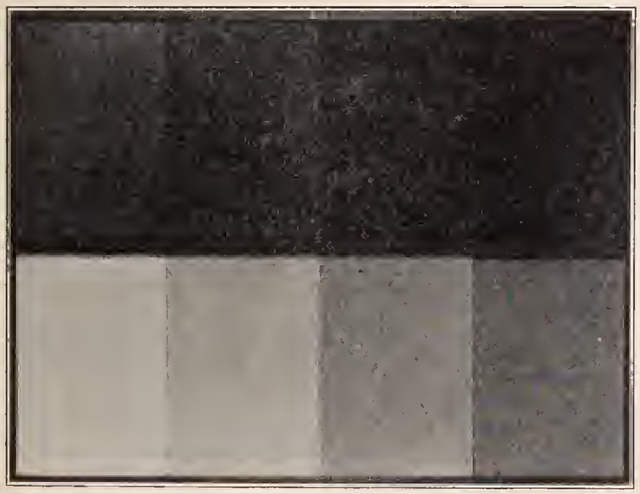

Fig. 2. Test object containing eight panels

The following experiments were tried to ascertain the magnitude of non-image forming light which occurs with the unprotected lens, and to get a practical estimate of the amount of lens flare existing in an objective of standard quality.

A set of eight neutral colored panels were prepared and mounted in a panel board (Fig. 2). These panels ranged in reflecting power .433 to .015 by approximate steps of 2.

Table 2. Photographic Reflecting Power of Panel Areas.

Area No.	1	2	3	4	5	6	7	8
	.433	.274	.173	.101	.069	.051	.032	.015

A Bell and Howell standard camera with a three component lens of good quality was mounted in front of this panel at such a distance that the image of the panel board just filled the motion picture frame. Behind the panel board were hung successively three background drapes of different reflecting powers. The backgrounds were large in comparison to the panel board. They subtended an angle of about 100 degrees at the lens. The panel board was uniformly illuminated from the front, hence the reflecting powers of the panel areas (measured photographically) were proportional to their brightness.

The test object was photographed using four different lens stops changing the background in each case to alter the amount of unnecessary light which entered the lens. In order to detect the presence of flare spots, the arrangement of areas within the panel board was systematically altered so that each test area occupied consecutively all of the eight different positions.

By sensitometric methods it is possible to determine the brightness of an image resulting in a given negative density. The developed images were measured on a densitometer and subsequently the data were recorded in terms of brightness. A typical set of data are given in Table 3.

Table 3. Relative Brightness of Test Object Images (Lens at F 32).

Area No. 1	2	3	4	5	6	7	8	Ratio of Peripheral Brightness to Average Object Brightness
.603	.390	.246	.156	.117	.102	.078	.061	7
.597	.367	.235	.139	.096	.077	.057	.042	1
.586	.351	.222	.128	.082	.065	.042	.024	.25

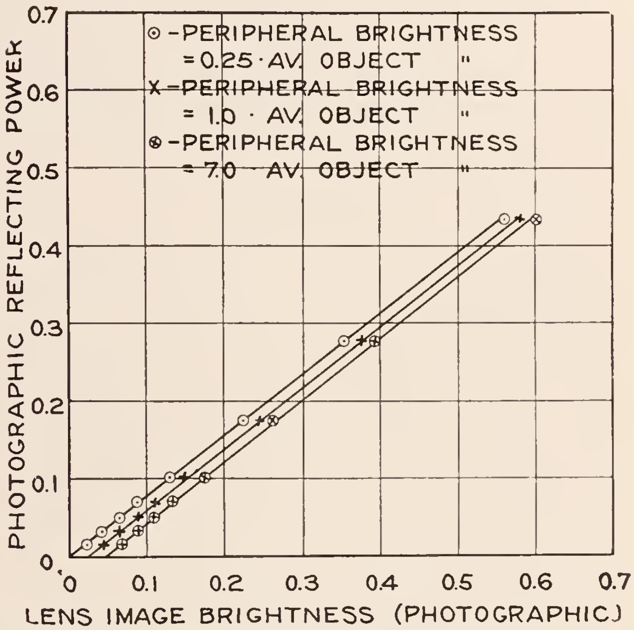

Fig. 3. Curves showing the relation between object and image brightness

The only variable in this set of data was the peripheral background brightness. Since none of this area was included within the film image any difference must be due to reflected peripheral light striking the film. That there is a great difference in contrast may be seen at once by comparing the ratios of highest to lowest brightness in the three cases: $\frac{.603}{.061}=10.1$; $\frac{.597}{.042}=14.2$; $\frac{.586}{.024}=24.2$.

In the last case, where a black peripheral background was used, the image contrast approaches close to that of the object. Obviously, light from areas surrounding the true image can seriously affect contrast. A graphical representation obtained by plotting the data of Table 3 against the photographic reflecting power (Table 2) is shown in Fig. 3. Here it can be seen that the addition of non-image forming light takes place rather uniformly over the entire frame. Since it is a uniform effect, the intercepts of these curves on the image brightness axis are indicative of the amount of non-image forming light. The intercept is the amount of veiling light which would be present over the image of a perfectly black object.

The intercepts of all sets (180) were found by least square method. The agreement between similiar sets is exceptionally good considering the numerous possibilities

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S. M. P. E. Meeting in New York

Record attendance expected at annual Spring meeting— Sound to be big feature—Twenty-seven papers to be read

As this issue of the American Cinematographer goes to press final details are being completed for the Spring meeting of the Society of Motion Picture Engineers, which will be held in New York City, May 6th to 9th. Advance information indicates that this meeting will be the largest ever held by the society.

Heretofore the meetings have been held in Boston, Washington, Norfolk, Virginia, Lake Placid, Hollywood, Rochester, etc. Some of these cities were difficult for some members to reach and necessarily limited the attendance. This year, however, a record attendance is expected. Headquarters will be at the Park Central Hotel.

The introduction of sound into the motion picture field undoubtedly has done much to increase the interest in the technical departments of the motion picture industry, and has greatly increased the realization of the importance of the technical work.

That sound will play a big part in the Spring meeting is evidenced by the part that eleven papers dealing with sound have been scheduled to be read. A total of twenty-seven papers will be read before the meeting.

W. C. Kunzman, National Carbon Company, is Chairman of the Convention Committee, which is as follows: Reception: W. C. Hubbard, H. T. Cowling, M. W. Palmer, W. C. Kunzman; Registration: Kenneth Hickman, W. C. Kunzman; Hostess: Mrs. L. C. Porter (assisted by Mrs. Palmer); Banquet: W. C. Hubbard; Master of Ceremonies Banquet: J. I. Crabtree; Sound Equipment: R. V. Terry, Bell Telephone Laboratories; Projection: Harry Rubin, Publix Theatres; Entertainment and Amusements: D. and A., Bulletins and Transportation and Press: P. A. McGuire; Studio Demonstrations; Dr. A. N. Goldsmith, R. C. A. Phototone, Inc.; Official Photographers: H. T. Cowling, Irl Gordon; Announcements: C. E. Milliken. J. W. Coffman is chairman of the committee.

The following papers have been tentatively scheduled to be read before the meeting:

1. The Universal-base sound film projector
   Mr. H. Pfannestiehl of Bell Laboratories, Inc.
2. Some Properties of Fixing Baths—
   Mr. J. I. Crabtree
3. A New Screen for Sound Film Presentation—"Da-Tone"
   DaTone Screen Company
4. Need for Improvement in Projection Equipment and Maintenance
   Mr. F. H. Richardson
5. A New Wax-Recorder for Sound-Film Production.
   Mr. L. A. Elmer—Bell Laboratories.
6. Re-recording: its importance and its problems.
   Mr. K. F. Morgan—Electrical Research Products, Inc.
7. Motion-Picture Theatre Architecture—(Architect to be selected.)
8. The Universal Camera Crane—Paper and illustrative motion pictures—
   Universal Film Company.
9. Sound-proofing the Camera.
   Roy Hunt—P. F. L.—West Coast.
10. A typical Sound Studio Recording Installation.
    Research Products, Inc.
11. Volume Levels in Theatres.
    H. B. Santee, Electrical Research Products, Inc.
12. Some Typical Problems in Process Photography—illustrated by film.—Carroll Dunning.
13. The Camera Battery—
    Mr. Karl Struss
14. Studio Economics
    Harry Goetz—Comptroller—P. F. L.
15. Public Announcement and reinforcement system for Theatres—
    Electrical Research Products, Inc.
16. Engineering Problems in set construction
    Cedric Gibbons, Art Director, United Artists.
17. Sound-film Direction—
    W. M. DeMille
18. Television Demonstration—
    Dr. Ives—Bell Laboratories
19. Lighting equipment for sound photography—
    Mr. Peter Mole
20. Improvements in incandescent lamp manufacture—
    Mr. Farnham.
21. Technique of Sound Film Editing—
    Hal Kern, United Artists, Editor-in-Chief.
22. Patent Problems in Business—
    F. T. Woodward, Electrical Research Products, Inc.
23. Characteristics of emulsions used for recording—
    Emory Huse—Eastman Kodak Company
24. Sound-Film Sensitometry.
    A. K. Aster, Bell Telephone Laboratories, Inc.
25. Developing Developments—
    Joe W. Coffman
26. The results of the experiment in Eastman Classroom films.
    Dr. T. E. Finegan
27. Motion Picture Problems in the Army—
    Major Walter E. Prosser, U. S. Signal Corps

MONDAY, MAY 6

10:00 A. M. Organization meeting, Park Central. Committee reports. Convention business.
1:00-2:00 P. M. Luncheon, Park Central.
2:00-5:00 P. M. Program—papers of general interest, not requiring projection equipment.
8:30 P. M. Park Central roof. Pre-view of forthcoming sound-film productions. Informal dancing.

TUESDAY, MAY 7

9:30 A. M. Special busses leave Park Central for Bell Laboratories.
10:00 A. M. Bell Laboratories Auditorium. Program devoted to papers and demonstrations of late developments in sound film production and projection apparatus.
1:00-2:00 P. M. Luncheon, Bell Laboratories Cafeteria.
2:00 P. M. Demonstration of interesting research apparatus and sound film equipment—Bell Laboratories Auditorium.
2:45 P. M. Program—More papers and demonstrations of the same type as outlined for morning session.
4:45 P. M. Television demonstration.
5:30 P. M. Busses leave Bell Laboratories for Park Central. Tuesday evening—free

WEDNESDAY, MAY 8

9:30 A. M. Special busses leave Park Central for R. C. A. Photophone Projection room, 411 5th Avenue.
10:00 A. M. Program devoted to papers and demonstrations of variable-area methods of recording and projection.
1:00 P. M. Luncheon.
2:00-5:30 P. M. Continuation of program. Possibly to be held at Photophone 138th Street Studios.
5:30 P. M. Busses leave for Park Central.
7:30 P. M. Banquet, Park Central roof. J. A. Crabtree, Toastmaster. S. P. Grace, Vice-President Bell Telephone Laboratories, will demonstrate the possibilities, humorous and otherwise, of inverted speech transmission and reception. Dancing afterward to music from Park Central orchestra.

THURSDAY, MAY 9

9:30 A. M. Busses leave Park Central for Paramount-Famous Lasky Studios. Astoria, L. I.
10:15 A. M. P. F. L. Projection room—program devoted to papers and demonstrations dealing with production problems.
1:00-2:00 P. M. Luncheon—P. F. L. Cafeteria.
2:00-3:30 P. M. Interesting points from papers presented by absentees. Round table discussion of motion picture engineering problems.
3:30-4:30 P. M. Open forum—general business.
4:30-5:30 P. M. Inspection of P. F. L. Studios.
5:30 P. M. Busses leave studios for Park Central.
8:30 P. M. Bell Laboratories Auditorium. Popular program of newly-organized Acoustic Society of America.

Our Technical Editor Talks to Chicago Cinema Club

Joseph A. Dubray, technical editor of the **American Cinematographer**, recently gave an interesting and instructive talk before the Chicago Cinema Club. His remarks had to do with new methods of making enlargements from 16 mm. film.

A practical demonstration illustrating the methods proved of great benefit to the amateurs present. Mr. Dubray is an interesting speaker, and has represented the American Society of Cinematographers at many conventions and before many learned bodies of scientific men. He is now director of technical service for the Bell & Howell organization in Chicago.

Mr. E. A. Reeve of the Bell & Howell Company also addressed the Chicago Club. He related his movie experiences in shooting Colorado scenics.

Lois Moran and George O'Brien in "Blindfold." A William Fox production.

Crane Mechanical Marvel

Most amazing photographic device in history of picture making used in "shooting" Universal's super-production "Broadway"

The filming of a successful photoplay calls for mechanical skill of the highest order, not only in the picture itself, but in equipment used in conjunction with it. This equipment the public seldom sees, the effects only being shown on the screen, but without such equipment the photoplay could not possibly be the finished product exhibited in theatres today.

A notable example of elaborate equipment used in the production of a motion picture is the huge camera "crane" used by Director Dr. Paul Fejos in the Universal all-talking super-picturization of "Broadway," and used by Hal Mohr, A. S. C., who photographed this picture. This "crane" was invented by Dr. Fejos especially for the picture and was built entirely in the plants of the Consolidated Steel Corporation, Los Angeles.

When the direction of both silent and sound versions of "Broadway" was assigned to him, Dr. Fejos determined to dramatize the "personality" of the huge Paradise Night Club set by getting photographic effects of its dazzlingly modernistic treatment never before brought to the screen.

He conceived the idea of a huge camera crane that would operate silently and with great speed: a crane that could be used almost as though it were made of elastic rubber. After several conferences with Mohr and Chief Electrician Graves and the Universal executives, he gave the idea over to the engineers of the Consolidated Steel Corporation. They developed the idea and the result was a machine which performs in a manner almost unbelievable.

In appearance the crane is a huge steel girder, 31 feet long of latticed steel, mounted upon a 14-foot cylindrical steel turret which in turn is mounted upon a six-wheeled truck chassis. At the extreme end of the girder the camera platform is mounted—a round, cagelike turntable, upon which are all controls. The complete device is driven electrically by a specially built battery of generators, weighs 28 tons, and cost $35,000 to build.

In operation this crane can achieve a complete and independent movement of its every component part, all simultaneously. The truck chassis can be moved forwards, backwards, or in any direction upon the ground, at any speed up to 25 miles an hour. The girder can be swung up or down at a rate of 300 feet a minute or horizontally in either direction, at a speed of 600 feet a minute; and the camera platform can be spun like a top. Inasmuch as all of these operations can be conducted at the same time while the camera records everything it sees, the photographic effects are indescribable.

Behind his camera on the platform, the cameraman, says Mohr, "can film effects equivalent to those which might be obtained on a particularly thrilling roller coaster and an airplane doing a barrel-roll simultaneously. Or, swung vertically in a complete arc of 180 degrees, he may at the same time revolve the platform 100 times a minute—all the while grinding his crank industriously. Extended upright, the girder is 50 feet from the ground, and it may be swooped down in two seconds."

Mounted upon the back of the truck chassis is the control-box, in which are placed switches actuating every movement of the entire crane, governed by the controls on the platform. Belts of cable over pulleys at the front and rear ends of the girder make even the slightest jar impossible. Four separate motors, contacted through automatic commutators, supply the energy for the various movements. The chassis brakes are supplied by other motors, upon which a reverse electrical load is instantly thrown whenever the main motors are cut off.

An automobile type truck gearshaft is used in propelling the crane, six speeds forward and one reverse being used. With the low forward speed, and caterpillar treads, the crane could be made the "stunt" equal of a wartime tank, even with the heavy girder attached.

The crane was used throughout those sequences of "Broadway," which were taken in the Paradise Night Club set, its swift movement being particularly valuable during the elaborate revue numbers when a chorus of thirty girls was used. It was possible not only to follow the action of the marvelously effective ensemble as the girls advanced to the foreground in the dance numbers, but at the same time to "zoom" upward and outward so that they were being photographed from all possible angles at the same time, without a break in the film.

This crane is so silent in action that it was used with perfect safety in the all-dialogue version of "Broadway" with the same ease with which it was used in the silent version.

It is of interest to record that when Dr. Fejos' idea and rough plans were first submitted to officials of Consolidated Steel Corporation, and an outline given of the stringent requirements the "crane" must meet, it was frankly declared an impossibility to create such a unit. In all the history of mechanical and electrical engineering there never had been such a contrivance. Its very impossibility, however, intrigued the imaginations of the corporation's experts, but it was not until after several weeks' close study of the problem presented, a study in which the head of every department in the huge steel organization took a part, that Consolidated Steel finally undertook the contract.

That the completed result outstripped the most sanguine expectations of both planners and builders is not only a striking testimony to the talents and resources of the steel corporation, but is also speaks highly for the spirit of close co-operation in which both steel and studio executives worked.

New Motion Picture Film Will Tell Story of Alloy Steels

Work on the production of an educational motion picture film which will tell the story of alloy steels has been commenced by the Department of Commerce, through the United States Bureau of Mines. The film is being prepared in co-operation with one of the large alloy steel manufacturing concerns, which has appropriated a sum of $10,000 to meet the costs of production. Every step in the manufacture of alloy steels, whose remarkable hardness and durability have greatly advanced the progress of the manufacture of great numbers of useful products, will be visualized in the making of the film. The many and varied uses to which alloy steels are put will also be illustrated. The film is being made with a view to instructing the engineer and engineering student, while at the same time making the story of alloy steels perfectly plain to the layman.

Benoit Signs with French Co.

George Benoit, A. S. C., who is now in France, has just signed a one-year contract with Les Films Historiques and his first production under the new contract starts this week.

Mr. Benoit's first picture made in France was released several weeks ago and is still making a big hit on the Grands Boulevards. The picture is "Le Capitaine Fracasse," and required seven and a half months in production.

Dr. Paul Fejos

It Does Everything But Talk!

A few intimate shots of the Camera Crane, invented by Dr. Paul Fejos, and used by Hal Mohr, A.S.C. in photographing Universal's "Broadway." This Crane was designed and built by the Consolidated Steel Corporation.

Carl Laemmle Jr.

Hal Mohr using machine

Mazda Lamps with Bulb Cleaners A New Development

By R. E. Farnum, *Engineering Department, National Lamp Works of G. E. Co.*

INCANDESCENT lamp performance is of particular interest to all cinematographers, since much of the success of their efforts depends upon a known and constant amount of available light Recent developments have made possible outstanding improvements in the 5- and 10-kw. MAZDA lamps that result in a 25 to 30 per cent increase in their light output, better maintenance of this light output during life, and less sagging of the filament coils.

R. E. Farnum

Blackening and its effect in heating the bulbs, has long been a limiting factor in the design of the high wattage lamps. If we could get rid of the blackening, the filaments could be operated at higher temperatures producing more light initially and maintaining the output throughout the life of the lamps.

During the operation of an incandescent lamp, tungsten is slowly evaported from the filament and is deposited on the inside of the bulb where it appears as blackening. When this evaporation has continued to a point where the filament has become sufficiently weakened or reduced in cross-section, the lamp fails. In the case of lamps used for general lighting service, the bulb surface is relatively large in relation to the wattage, and hence the bulb blackening is not so marked. High wattage lamps used for motion picture photography have bulbs that are materially smaller in relation to wattage than do the smaller sizes, and hence bulb blackening and its effects have been the limiting factor in their design and performance.

D. K. Wright, one of the engineers at the Nela Park Laboratories, has recently developed a simple, yet most effective, method of cleaning the blackening from the inside of the bulb. As a result of his ingenious work the motion picture studios not only gain about 30 per cent of the initial light output of equipments using these lamps, and besides, the losses due to bulb blackening heretofore suffered have been practically eliminated. His work will be worth many, many thousands of dollars to the motion picture studios.

The solution of this bulb blackening problem was obtained by enclosing in the bulb a specially prepared coarse tungsten powder. After twenty or thirty hours' burning, when the bulb has become appreciably dark, the lamp is held by its neck near the base and given a whirling motion with the result that the cleaning powder scours the interior of the bulb and removes all of the bulb blackening. This is repeated at intervals during the life

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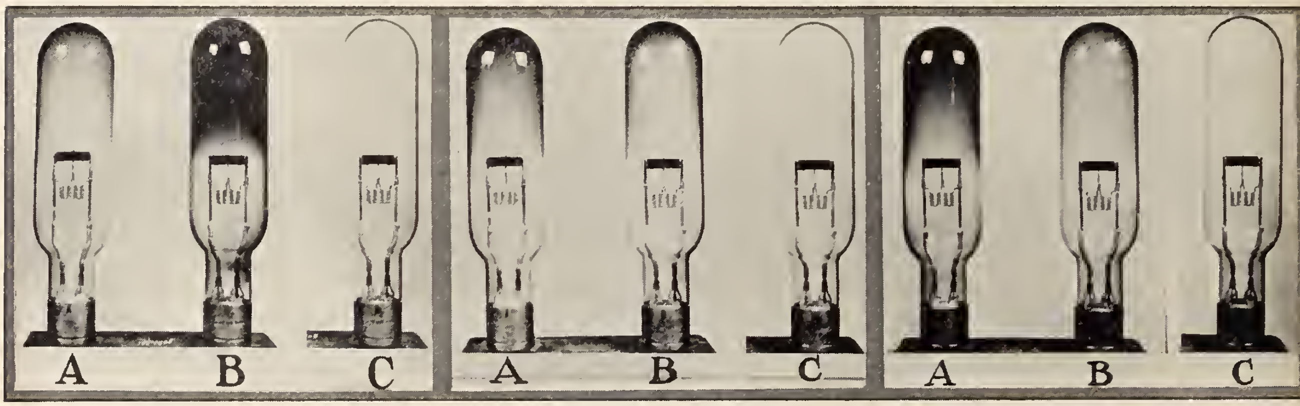
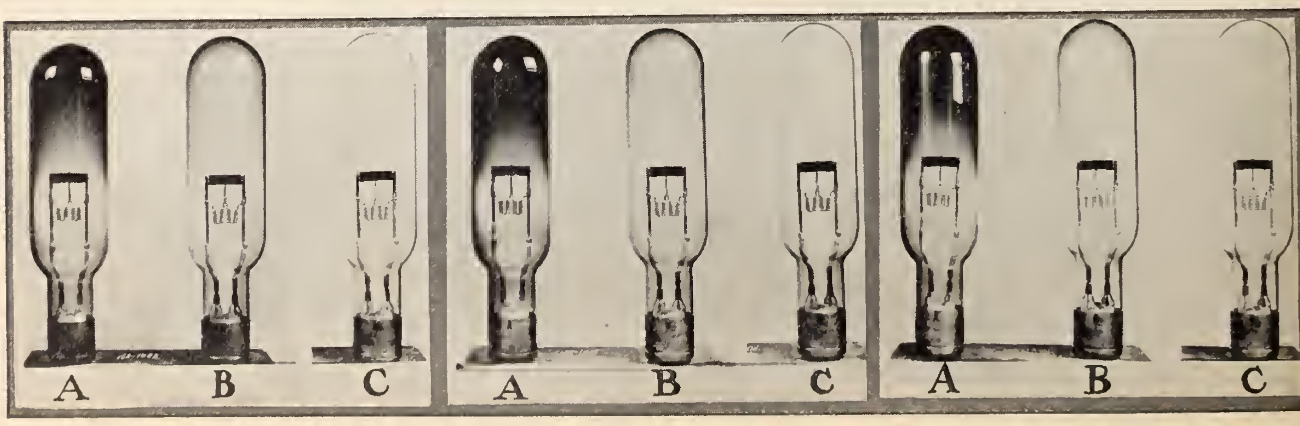


Lamps "A," reading left to right, starting with upper row, shown after successive 25-hour periods of burning. Lamp "B," poor lamp and lamp "C," same poor lamp after being cleaned following these burnings. Note how poor lamp is cleaned it appears almost like a new one.



Again Science Conquers!

IN the lexicon of the movie studio there is no such word as "impossible." Film producers have a habit of conceiving miracles...and of creating them!

Yet in all the history of mechanical attainment in motion picture production, nothing so daring had been attempted as the marvelous electric camera crane now the property of Universal Pictures Corporation. To Director Dr. Paul Fejos goes the credit for its conception.

But without the knowledge of Consolidated Steel Corporation engineers and the resources of the corporation in men and materials, the conception would have remained a dream.

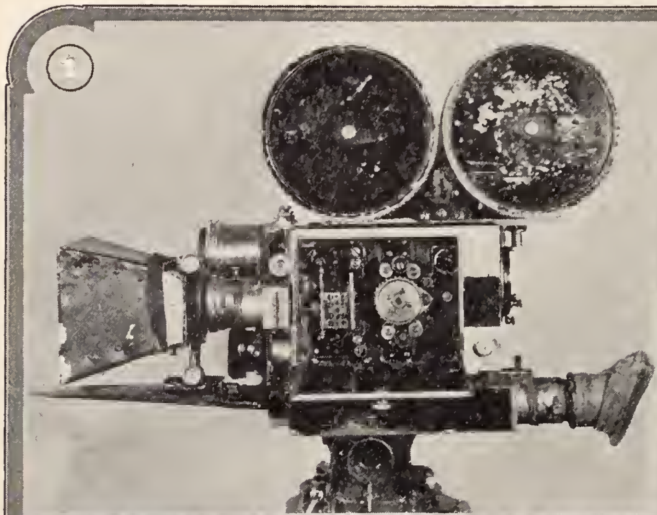
Technicians of both studio and steel organization worked in harmony in the production of this mechanical marvel. The result has astounded even its creators, for with it camera effects can be obtained which before were unknown.

CONSOLIDATED STEEL CORPORATION

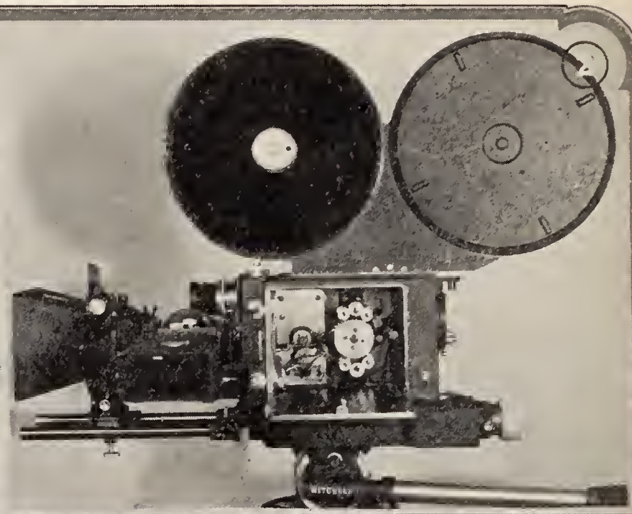
CSC

LOS ANGELES CALIFORNIA

Taking the Click Out of Cameras



An intimate shot of the camera movement that produces the clicking which is now so obnoxious in the taking of talking pictures. In the new movement of the Mitchell camera, a piston arrangement and fibre gears preclude the clicking.



Revealing the movement in the new silent Mitchell camera. A piston arrangement has precluded the clicking that is incident to the operation of the old style of camera that is employed in photographing silent pictures. Fibre gears are also used in this part of the mechanism.

With the growing popularity of talking pictures, silence has become proverbially golden in motion picture studios and, as a result, there has come about a re-adaptation of the professional cinematographic camera.

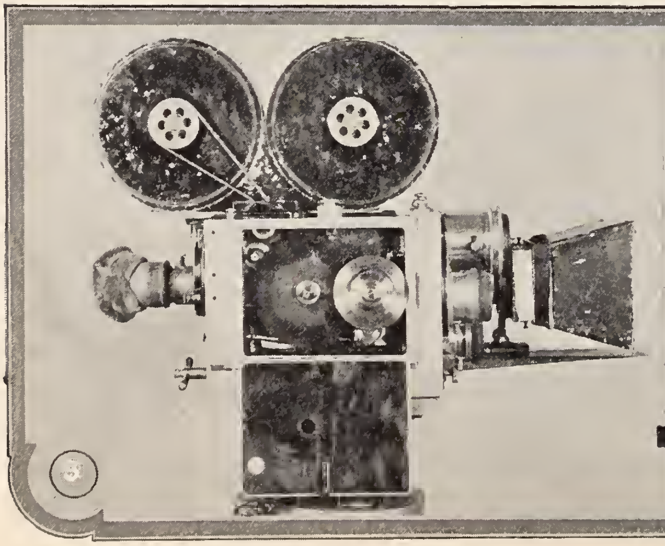
First attempts at talking pictures were attended by ponderous arrangements wherein the camera was enclosed in a sound-proof booth in which the cinematographer sweated and smothered until the completion of a given scene.

This awkardness has been precluded to a great degree through the revamping of the professional motion picture camera. In the Mitchell outfit no two metal gears are permitted to work against each other. On the contrary, metal gears are set against Bakelite gears, thus avoiding noise that, in the past, produced the venerable "click" of film cameras.

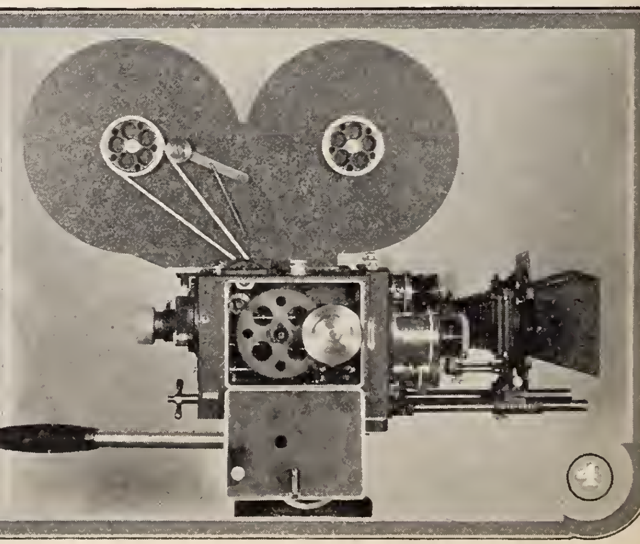
In addition, the Mitchell organization has taken out ball bearings wherever possible. Thousand-foot magazines, instead of the former standard of 400 feet, are employed on the new sound cameras. The reason for the larger magazines, of course, is to do away with frequent changes of film on the sound stages. In other respects the Mitchell camera remains practically the same, the standard high-speed movement being utilized in the sound as well as the former models.

Instead of the metal spring take-up belt as used on older models, a cloth belt is stocked on the sound cameras. The sound cameras are motor driven.

Results have been so successful that at the RKO studios in Hollywood, where the RCA Photophone system is being used to film and record Radio Pictures, no camera booths are being employed. The cameras are operated practically in the open, with screens being utilized occasionally to deflect the voices of people speaking on the sets. Two motors operate the camera and the recording apparatus, respectively. These motors are synchronized.



Here is a close-up of the gear system on a Mitchell camera that is used for silent pictures. There is no fibre gear system as on the new silent sound cameras. The belt which operates the pulley on the magazine is a metal spring. On the new sound cameras this belt is made of cloth.



Close-up of the gear system on the new Mitchell sound camera. The principal gears are made of fibre instead of metal. No two metal gears touch each other under this arrangement. Operation noises are thereby eliminated. Note the cloth take-up belt connecting with the pulley on the magazine.

Cino-Spectrometer Designed by Hollywood Electrical Engineer

Detailed explanation by the inventor of the construction, uses and method of using a device designed for the purpose of reading and analyzing light

By R. E. Norman, *Electrical Engineer with the Otto K. Oleson Co.*

[Mr. Norman's application for a patent on this device has been filed at Washington. The inventor declares that this invention will remove all guesswork and the danger of human error from the light end of motion picture photography. Rather than attempt to write about this ourselves we asked Mr. Norman to write it himself. The article will be in two installments.]

I HAVE designated my invention as a cino-spectrometer and have perfected the method of using and applying same in the theatrical, photographic and motion picture industry; in the taking of any kind of photographs, developing the negatives, printing the positives and in the showing of pictures in theatres.

My cino-spectrometer is an instrument for reading and analyzing light as pertaining to objects such as in moving pictures.

One object of my invention is the development of a scientific and accurate manner of operation in the moving picture industry, from the taking of the pictures to the showing of them to the public.

In each and every distinctive step in this procedure, light is required, being first used in taking the photograph and from data thus secured the developing is accurately controlled. The control of light is an important factor in the printing of the positive film from the negative and on the control of light in a picture projector is dependent to a great extent the satisfactory representation of the picture.

Under the present practice of taking moving pictures or in fact photographs of any nature, there is no accurate and scientific way of measuring the quantity of light combined with what might be termed its quality from a photographic standpoint, independent of the comparison by the eye or skill in the art of photography.

There are various light registering devices used in photography such as sensitized material or the like which may be exposed to light for a certain definite time, thereby to a certain extent giving an idea of relative illumination, but this must be compared with a standard, or dependent upon the eye.

There is no definite procedure for determining the quantity and the quality of light which passes through a camera lens and affects photographically the film on which the scene is photographed. As most of the devices used as aids to the photographer or camera man in determining the photographic value of light consume considerable time and also rely on his judgment, they are rarely used, the skill of the camera man in motion pictures being relied upon to obtain a satisfactory result.

In all photography, especially as applicable to moving pictures, it is well known that the different colors of objects have a material effect on the resulting picture. Some objects photograph much quicker than others, even when films are used which are more or less sensitive to the whole range of the spectrum, and as the colors which photograph poorly are those to which the eye is most sensitive and those colors which photograph readily are colors to which the eye is more or less insensitive, a person cannot readily judge the photographic value of light being reflected from a scene in order to accurately operate a camera in taking motion pictures to secure uniform results. For instance, the lights of short wave length such as the violet, the invisible, ultra-violet and the indigo are very actinic in their photographic powers and may be termed photographically positive colors. The eye, however, is not very sensitive to these colors, the ultra-violets not registering on the retina as colors. The orange and red of much longer wave which may be designated as photographically negative colors, do however, impress the eye and cause a person to misjudge the photographic effect of any definite scene having these colors incorporated with others.

Objects of the various colors of the spectrum may be satisfactorily photographed on a time basis, giving the photographically negative colors a longer exposure than the photographically positive colors, but as a rule this is not possible in moving pictures as these have to be photographed a certain definite number of exposures per second, and in various scenes the colors present different proportions. Most of the devices for indicating the photographic value of light are not adapted to use in registering the light reflected from any particular scene as it is difficult for a camera man to properly estimate the light, my cino-spectrometer may be utilized to obtain definite recordable values from a photographic standpoint.

The construction and operation of my cine-spectrometer will be first described in its application to the manual and automatic manipulation of cameras; its secondary application in the developing of films; its manual application in printing and procedure in recording the proper light for projecting pictures.

The cino-spectrometer as an instrument comprises a photo-electric cell which may be properly mounted to receive light having various electric circuits for energizing the cell and preferably amplifying the currents as affected by the resistences and the electron flow developed in the cell and in conjunction therewith a meter which may be utilized to register the quantity and photographic quality of the light. This meter may be self-recording if desired. The photo-electric cell may have any suitable light sensitive surface utilizing selinum or some of the so-called alkali metals such as potassium, sodium, lithium, rubidium, etc. However, as the photo-electric cells may be readily purchased on the market, I have found it satisfactory to use a cell sold under the trade name of Radiotron U. X. 112 tube. This combines photo sensitive materials with a triode tube for developing an electronflow and amplifying to a certain extent.

In the taking of moving picture photographs the moving picture camera is usually provided with a rotatable turret having four lenses having photographic qualities. When focusing a camera the lens to be used presents an image to one side of the camera proper, the camera being shiftable laterally so that an exact focus may be obtained in the position in which it will register on the film. Then the camera is replaced in photographic position and the turret turned for taking a picture. In the camera I preferably mount the photo-electric cell in such a position as to have the image cast thereon and therefore obtain the full light value from a quantity and quality standpoint as it would be recorded on the film. Then by reading the meter or noting the automatic recording meter the camera man or his assistant will note the reading defining the quantity of light. Although the meter I use is in effect a milli-ampere meter, it may be graduated in units defining certain established quantities of light. I may if desired use such quantities as are equivalent to the so-called units of lumens or other arbitrary values.

In the manual or automatic manipulation of cameras in accordance with my method, it is necessary to have a table or chart prepared showing the proper iris opening for the camera and time of exposure for different units of light as recorded by the meter. Therefore the camera man after properly focusing the scene and noting the meter reading caused by the photo-electric cell will set the iris to the designated value; or to the iris may be automatically operated, and the shutter to be operated the proper speed, and thus the photographs may be taken on a scientific basis independent of judgment of light values and such like by the eye.

A reel in being taken has recorded thereon the light value at the time of taking. In the developing of the film a developer having a certain formula and time of development will be utilized in accordance with another prepared table or chart showing the photographic solutions required, temperature of same and time of development for films taken under certain known units of light value.

In printing the negative a standard light is shone there through on to my cino-spectrometer in order to obtain the light value transmitted through the film. In reality this measures the relative density of different films. I may either use a standard light such as utilized in the printing or a separate standard light which will give a known reading. A set of tables or charts prepared from films of standard density as recorded on the meter through the electric fluctuations caused by the light on the light on the photo-electric cell as shining through films is then utilized to determine the iris opening of the printing lamp and the voltage required for such lamp. The light used in printing may be varied by changing the iris opening through which the light passes through the negative or by changing the intensity of the light.

In the projection of moving pictures the quality of the picture is dependent very much on the light in the projector and also on the reflective quantities of the screen. Therefore, I use my cino-spectrometer in the theatres for reading the quantity of light as reflected from screens and thus determine the intensity of light required in the projector to give a certain definite standard result, and making it possible for studios to use a standardized density for all released prints.

My invention in its several phases as an instrument and a method of procedure will be more readily understood from the following description and drawings, in which:

Figure 1 is a side elevation taken in the direction of the arrow 1 of Fig. 2, showing a moving picture camera with my cino-spectrometer mounted thereon in position for recording the quantity and photographic quality of light from a scene to be photographed.

Fig. 2, is a rear elevation of the camera taken in the direction of the arrow 2 of Fig. 1.

Fig. 3, is a diagrammatic view of a photo-electric cell incorporated with a triode valve, the electric circuits therefor and indicating a meter.

Fig. 4, indicates diagrammatically the light sensitive portion of a standard photo-electric cell.

Fig. 5, indicates diagrammatically a self-recording meter for indicating the quantity and photographic quality of light.

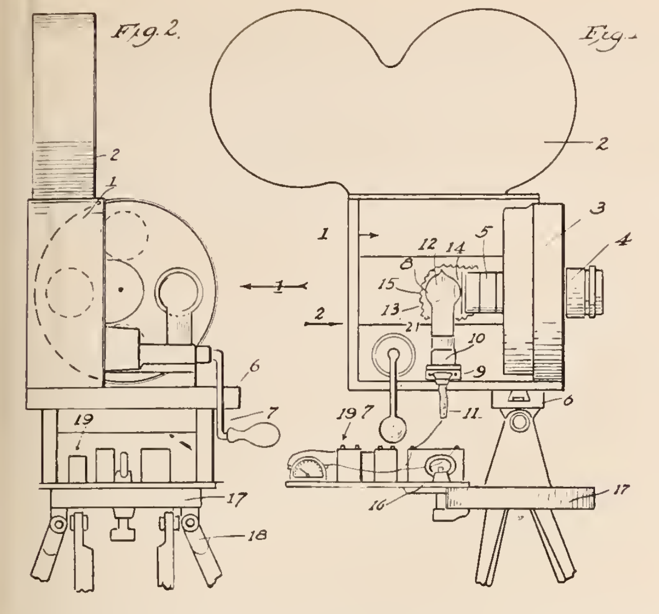
Fig. 6, is a diagram of a mounting for my cino-spectrometer in printing from negatives, utilizing the light from a standard printing lamp.

Fig. 7, is a mounting alternative to Fig. 6, utilizing two standard lamps, one for printing and the other for measuring the light through the negative, both lamps being on the same circuit.

Fig. 8, is a diagram of a circuit similar to Fig. 3, suitable for recording such light, and operating a relay.

Fig. 9, is an elevation partly in section of my cino-spectrometer separately mounted on a stand and showing it usable as a separate instrument for recording the quantity of light as for measuring the intensity of reflected light from a theatre screen, painted surfaces for mixing paint, etc.

Fig. 2. Fig. 1



The adaptation of my cino-spectrometer to a camera is substantially as follows, having reference particularly to Figs. 1 and 2:

The camera is designated generally by the numeral 1, having a magazine 2 for the films and a rotary turret 3 having lenses 4 mounted thereon. A focusing lens 5 is secured on one side of the camera so that when the camera is shifted laterally on the track 6 any particular lens through which it is desired to photograph may be positioned in register with the focusing lens 5. The ordinary crank for winding the films and taking the photograph is illustrated by the numeral 7.

The above description and drawings designate a well-known standard type of camera, but it is to be understood that my cino-spectrometer may be applied to other types and makes of cameras by having the mounting as desired.

A photo-electric cell 8 which may be of a standard type or specially constructed for use with cameras is mounted on a bracket 9, this latter being preferably secured to one side of the camera, the bracket having a socket 10 whereby the lamp makes the proper electrical connections through a lead conduit 11.

The photo-electric cell generally is formed with a glass bulb 12 at the end having a silver coating indicated by the numeral 13 with a window 14 through which the light enters. This window will be placed directly in the path of the light so that the image will be cast inside the bulb and therefore the cell will be affected by the total quantity of light which would photographically impress itself on the film were a picture being taken. A hood 15 of light-proof flexible material is utilized to cover the focusing lens and the photo-electric cell to exclude external light.

For purposes of illustration I have indicated the various batteries of sources of electrical power as being mounted on a table 16 secured to a cap 17 on the tripod 18. These instruments are designated generally by the numeral 19 and are better described in connection with the diagrams.

Referring to Fig. 3, a suitable circuit and diagrammatic mounting of a photo-electric cell is indicated by the numeral 8, the reflector by the numeral 13, a light sensitive material by the numeral 20, the focusing lens being designated by the numeral 5. The triode elements of a tube are designated by the numeral 21 and are usually placed in the lower end of the tube and screened from the photo-electric material by a partition 22 as indicated in Figs. 1 and 4.

These elements comprise a filmament 23, a grid 24 and a plate 25. The grid is connected by an electric lead 26 to the light sensitive material 20. The plate 25 is connected to a ring 27 situated in the path of electrons flowing in the light beam; the ring and plate being electrically connected by a lead 28.

An A battery 29 usually of about 4½ volts is connected through a variable resistence 30 to the filament and has a volt meter 31 connected to the circuit. A "B" battery 32 which may be of 90 to 500 volts is connected to the filament circuit and through a variable resistence 33 by a lead 34, through a meter 35 and a lead 36 to the plate and ring, being electrically connected to the lead 28.

As above mentioned the meter 35 is in reality a milliampere and may be so graduated or graduated in the arbitrary units of light. A volt meter 37 is in this work circuit of the B battery. A "C" battery 38, which may be of 45 volts is connected through a variable resistence 39 and the lead 40; a resistence to the light sensitive material 20 and hence to the grid 24. This circuit has a volt meter 41.

Continued on Page 28

Fig. 3

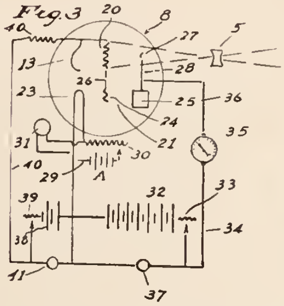


Fig. 4

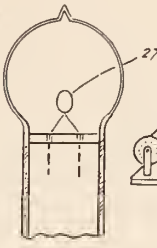


Fig. 5

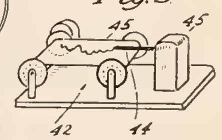


Fig. 6

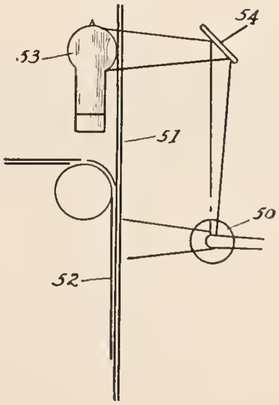


Fig. 7

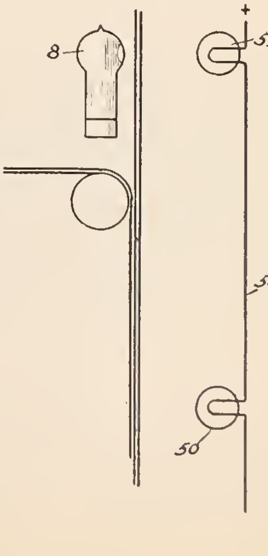


Fig. 8

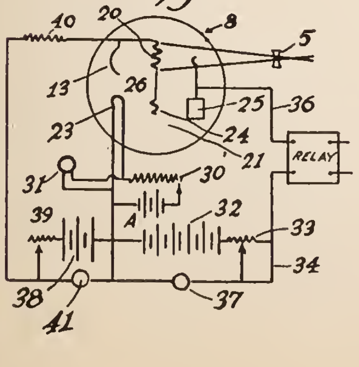
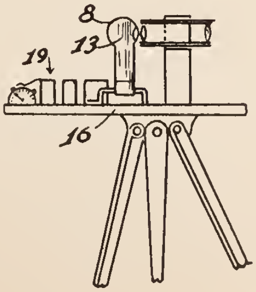


Fig. 9



Factors Which Affect the Contrast of a Lens Image

Continued from Page 11

for experimental error which the method involves. Table 3 summarizes the average data for the four different lens openings. Since the absolute value of the intercept depends upon the intensity of the image-forming light, which is different with different lens openings, it seems best to express the amount of non-image forming light by means of the ratio between the intercept and the average image intensity. This ratio is denoted by R in Table 4.

Table 4. Relation Between Brightness of Non-Image Forming Light and Average Image Brightness for Various Conditions

F=Number of Lens Stop	Ratio of Peripheral Brightness to Average Brightness of Test Object	R=Ratio of Image Brightness Intercept to Average Image Brightness
32	7	.194
32	1	.094
32	.25	—.003
11	7	.133
11	1	.072
11	.25	—.001
8	7	.110
8	1	.039
8	.25	.003
3.5	7	.230
3.5	1	.029
3.5	.25	.004

There is present only a small amount of non-image forming light in all four cases where the background brightness was low in comparison to the average object brightness. As a matter of fact, the intercept of the curves such as A in Fig. 3 was in all cases less than the probable error of measurement.

There is no consistent variation of R with the change in lens opening. The uncertainty of the variation in effective area of reflection surfaces within the lens makes it impossible to guess at any correlation.

It can be stated that for this particular lens, at least, the flare image light originating in the object is distributed throughout such a wide angle that the effect upon contrast of an average subject such as is represented by the test object is negligible. On the other hand, the presence in the camera of light from the peripheral area has a very serious effect. Sky brightness in exterior pictures, for instance, might in many cases be enough greater than the average object brightness to reduce the image contrast by a factor of from three to five. An even greater reduction of contrast is possible in studio work where light from bright sources outside of the object area may enter the camera. It has been pointed out in a previous paper (1) by one of the authors and L. A. Jones, that contrast reduction due to the presence of non-image forming light in a screen image cannot be entirely compensated by laboratory treatment of negative and positive. The same argument will hold in the present cast. Though a flat picture may be considerably improved by increased development of negative and positive, the results cannot approach the quality of a correctly exposed negative free from non-image forming light fog.

Lens Shades

Since the exclusion from the lens of light which is not used in the image appears to be of importance, it seems desirable to give some consideration to the means by which this may be accomplished. In some cases, as in the making of titles and in some studio sets, the brightness of the peripheral border can be controlled. The title board may be surrounded with black cloth as was done in the experiment just described. In studio photography care in the darkening of walls and windows which lie outside of the field of the lens, would undoubtedly add to the brilliance of the picture.

In most cases, however, the use of a lens hood is the only solution, for the amount of non-image forming light striking the lens can be controlled only in this way. To limit the cone of light entering the lens, a rectangular hood seems the most desirable. A rectangular hood attached to the camera cannot, of course, exactly limit the field without vignetting the picture. It must always be somewhat larger than a frame enclosing the pyramid whose apex is the lens center and whose sides are the rays converging to the center. The following approximate relation will give the size of the frame nearly enough for practical purposes.

$$\text{Length of Rectangle} = \frac{\text{Length of Hood}}{\text{Focal Length of Lens}}$$

+ Aperture of lens. The width of the lens aperture is found by dividing the focal length by the F number of the lens. The larger the lens hood, the less will be the amount of extraneous light to enter the lens. The length of the hood is limited by practical considerations but the beneficial effect of the hood, at least for short focus lenses, is very marked even with a short protecting hood.

A subject having a visual contrast of about ten to one was photographed out of doors using a two-inch focal length lens and various types of lens hoods. With no hood to protect the lens from the light of the surrounding sky, the contrast of the image was reduced about forty per cent. With a hood fourteen inches long, rectangular in shape, the reduction in contrast was less than five per cent, and with a cylindrical hood of the same length, the reduction was about ten per cent. As the hood was shortened and the hood openings made correspondingly smaller in size, the beneficial effect was somewhat decreased. However, even with a two inch hood supporting a rectangular aperture in front of the lens, the image contrast was only twenty per cent less than the object contrast value.

Disturbance of Contrast Due to Diffusing

Under the general heading of diffusion may be grouped a number of causes such as dust, finger prints, air bubbles, and imperfect polishing. Data regarding the magnitude of these effects upon contrast is almost valueless since so much depends upon the particular case. A single well-defined finger print upon the surface of a lens may reduce the contrast of the image to one-half of that formed with a clean lens. Dust and air bubbles, if present in great enough quantity to scatter light, may decrease the contrast still further. The effects of diffusion are in practice always superimposed on the disturbances caused by internal reflection and lens flare. That they may be made of negligible consequence is indicated by the almost perfect reproduction of object contrast which was attained in the experiments previously described.

1. The Effect of Projection Lens Flare upon the Contrast of a Motion Picture Image. Loyd A. Jones & Clifton Tuttle. Trans. S. M. P. E. No. 25.

Eastman Research Laboratory Opened in Hollywood

New building last word in laboratory equipment. Contains 35-seat theatre equipped for sound.

ON WEDNESDAY, April 24th, the doors to the new technical research laboratory of the Eastman Kodak Company, at 6706 Santa Monica Boulevard, Hollywood, were thrown open.

And with the opening of this laboratory a long felt want on the part of the cinematographers and technicians of the film capital was filled. For the past ten years executives in the picture industry have realized this need, and rejoicing was general throughout Hollywood when the word was passed that the building had been opened.

The new laboratory, to be operated by the West Coast technical service staff of the Eastman organization, is a thing of extreme architectural beauty as well as a laboratory equipped with every known latest contrivance for the furtherance of the film industry's technical department. It is of reenforced steel and concrete and is 118 feet deep and 35 feet wide and 35 feet high.

The interior is finished in gumwood, with walls a soft gray and with exquisite window hangings that blend. The large foyer is furnished with tastefully selected divans and chairs of overstuffed red leather. There are three offices on the second floor, also a library and conference room.

One of the big features of the building is a theatre equipped for both disc and film sound picture projection. The throw from projector to screen is approximately 60 feet; the ceiling is 25 feet and the width of the auditorium is twenty-five feet.

The theatre is equipped with the very latest in the way of projectors and sound equipment and can well be described as the last word in little theatres. Thirty-five of the latest pattern theatre chairs, wicker with deep cushions, have been placed in the theatre; and each row is placed slightly higher than the one in front, making vision an easy matter for all. There is room for extra chairs, making the theatre capacity fifty.

A research laboratory containing approximately $35,000 worth of modern equipment is another big feature for the cameramen. No expense has been spared in fitting this laboratory with the very latest in laboratory equipment. This laboratory will be open to the cinematographers and technicians of the various studios at any and all times.

With the opening of the laboratory came the announcement by E. O. Blackburn, head of the J. E. Brulatour, Inc., West Coast department, that the laboratory is to be devoted to the cinematographers and technicians of the industry. In other words, the laboratory is as much theirs as though they had built it themselves.

"We want the cinematographers and studio executives and technicians to feel that this is their laboratory," said Mr. Blackburn. "We have built it for them, and it is theirs to use at all times. They will always find our own experts on hand to help them in any way they may desire. Our aim is to give the cinematographers and studio executives real service."

And to prove that there will be a real service at this laboratory, a feature has been introduced that will fill one of the greatest needs of the cameramen. It is a telephone call service. It is the desire of the laboratory officials to have the name and address and telephone number of every cameraman in the industry listed at the laboratory. Then a real personal service will be given each man at no cost whatever. This is one way in which it will work: A producer decides he wants to hire a certain cameraman. He cannot locate him. All he needs to do is to telephone the laboratory. The laboratory will know where the man is at all times. If he is a thousand miles away on location the laboratory will get a message to him no matter what the effort or cost. The laboratory will make this one of its services to the cameramen.

If a cameraman is away on location and some pressing business arises back in Hollywood that must be attended to at once, the laboratory officials will attend to this business, even to the extent of paying a bill if it is within reason. A man's income tax may be overdue and he in the South Seas or the wilds of the mountains. The laboratory will attend to the matter and allow him to pay them on his return.

A cameraman or a studio executive may have an idea for some sound device or something pertaining to film. He can take it to the laboratory and there can either work on it alone or can have the aid of the experts of the laboratory in working out his problem.

There will be a secretary on duty at the laboratory. If a cameraman wishes a letter written the secretary will do it for him and see that it is mailed. In other words, the laboratory belongs to the cameramen and studio technicians and executives—an Eastman service.

With the theatre for sound, and other equipment for sound research, sound problems that are daily coming up in the studios can be studied.

The theatre will be open for the showing of pictures at all times. If a studio executive has a picture he wishes to see privately, he may bring it to the theatre in the laboratory and there may have it projected by the laboratory projectionist, or if he wishes still more privacy, he may bring his own projectionist along and see it and study it with all the privacy of a theatre in his own home.

In the meanwhile the Eastman experts will be constantly working at the laboratory on the various problems that are confronting the industry and will be ever on call by any of the studios.

Perry E. Conner will be in charge of the laboratory and will have an able corps of assistants.

In brief, the laboratory is the last word in completeness and is built for service.

An International Congress of Scientific organizations of Labor is to be held in Paris in June next, and will be presided by Mr. Tardieu, French Secretary of the Interior.

The aims of the convention are mainly to establish personal contact between adepts of scientific organizations, to promote exact information on previous work of the different organizations, to give the members an exact knowledge of scientific organization, to forward the progress of scientific organizations and to draw a certain number of conclusions from the work of the convention and to submit them to trade organizations, to Governments and to the public.

American films are solicited for showing at the convention. The films to be shown must be those illustrating methods and conditions of work of various enterprises and films showing the application and principles of scientific organization.

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A. B. C. OF SOUND PICTURES

By JOSEPH A. DUBRAY, *A. S. C.*,
(Third Paper)

WHILE physicists were busily engaged in the study of sound vibrations and were making great strides towards the ideal reproduction of sounds, photography was emerging from the realm of the research laboratory and was rapidly taking its place among the essentials of modern civilization.

About the time at which Edison's phonograph made its first appearance, the photographic gelatine emulsions were bringing about a complete revolution in photographic methods and processes, and photography began to lose much of the mystery with which it had been surrounded.

The facilities afforded by the workings of the new photographic processes not only made the new Art so popular that it emerged from the stage of slow evolution to enter the field of extremely rapid progress, but also became an indispensable subsidiary to almost all scientific research.

The keeping qualities of the sensitive gelatine emulsions and the removal of the rather complicated laboratory procedures which had characterized the earlier processes greatly broadened the field of usefulness of photography, which became still greater after the discovery of the means by which the sensitivity of the emulsion could be increased many-folds.

Photography then entered the field of instantaneous exposures, and this and the knowledge of the phenomenon of persistence of vision, lead researchers throughout the world to investigate the possibilities of reproducing movement.

The works of Marey, Muybridge, Jannsen, Friese-Green, Le Roy, Edison, Lumiere and a legion of others, are too well-known to warrant indulging in their decription. The efforts of these scientists and artisans resulted in the motion pictures of today.

The interest aroused in scientific circles by the rapid evolution of photography could not but command the attention of the American wizard, Thomas Edison, and his researches and inventive genius finally produced the Kinetoscope, the first commercial instrument through which motion pictures could be seen. The instrument presented, of course, a number of limitations, chief among which was the fact that only one person at a time could view them.

This limitation was nevertheless of minor consequence in Edison's mind, since his main object was to **"find an apparatus which would reproduce a great number of photographic images IN COMBINATION WITH THE PHONOGRAPH."**

It is fairly well known that the synchronization of the series of photographic pictures with the sounds emitted by the subject being photographed was the main goal to which tended Edison's efforts.

It was in 1887 that Dickson, working then in collaboration with Edison, brought to light an apparatus on which the photographs were taken on a glass cylinder, previously coated with a sensitive emulsion, and synchronized with a cylinder sound record.

While Edison and Dickson were at work in the solution of the problems involved in their investigation, another great step towards the development of photographic procedure was being made. The possibility of preparing celluloid sheets of uniform thickness and transparency lead some investigators, among whom George Eastman, to replace the glass plate by this flexible material as a support for the photographic sensitive emulsion.

The importance of this revolutionary advance in the art of photography is perhaps under-estimated by modern photographers and cinematographers, who have become so accustomed to its use and to the perfection of manufacture of this produce that the real portent of the discovery is little recognized.

Anyhow, Edison did not overlook the possibilities inherent to it and since George Eastman began to be able to supply him with short emulsion coated celluloid strips, he replaced the glass cylinder for them, and, in 1888, he completed a first apparatus which combined a film Cinematographic camera and a phonograph recorder. This apparatus was called the **"Phonokinetograph."**

The synchronization and reproduction of the photographic and phonographic records were obtainable by mechanical means, and this explains the little success of the process which never entered the field of commercial exploitation.

The problems inherent to the process and which Edison and Dickson set to solve, were mainly those pertaining to the synchronization of the photographic record with the sound record. The task was arduous at a time when both apparatus, the motion picture camera and the phonograph were still in their embryonal stage.

The laboratory experiments of these two indefatigable workers remained as such, and only the withdrawal of motion pictures from the peep-hole box and their presentation upon a screen seemed to open new horizons for the development of the ambitious dream.

It must be kept present to the mind that the phonograph of these times, though giving a marvelous display of a man's intelligence and love for Science, was nevertheless a mere toy when compared with the instrument of today, and motion pictures were but a crude attempt to give an impression of motion obtained with inadequate instruments and facing a number of undreamed of problems. Nevertheless, the promises that the two infants held in store were amply justified by the unselfish work and the faith of few enthusiasts.

In the secrecy of their laboratories, other researchers were devoting their time and energies to the solution of the same or similar problems, and a remarkably broad vision of the possible solution of the problems inherent to pictures and sound synchronization was given to the world as early as 1880 by the work and disclosures of Fritts, but with no practical application.

The brilliant achievements of the Lumiere Brothers, in 1896, at which time motion pictures were finally shown to an audience by projection upon a screen, spurred scientists all over the world, and, in 1898, we find a Frenchman, Mr. Ducom, developing a synchronized system through which the phonographic record was heard by means of a head piece. Each seat of an auditorium was equipped with such an instrument.

In 1900, another pioneer in French Motion Pictures, Mr. Gaumont, presented a phonograph and a motion pictures projector mechanically synchronized. The two records were, however, to be made separately, due to a number of mechanical limitations which seemed unsurpassable at that time.

In America, a mechanical genius, Daniel Higham, was in the meantime inventing a loud-speaking phonograph, and Edison, always anxious to gather around himself the most promising talents, engaged him and from their association a mechanical synchronizer was born through which for the first time a picture and a sound record were made simultaneously, and presented to an audience limited in number, it is true, but nevertheless an audience which did not have to depend upon individual head pieces or individual picture apparatus for seeing and "hearing" a motion picture.

Pathe Freres, in France, also tackled the problem, and succeeded after several years devoted to experimentation, to obtain a remarkably good synchronization in both the taking and the producing of sound pictures which followed the fate of all other similar systems, that is to

Continued on Page 39

Everybody's in the Movies Now

A New Family Album is Now Revealed, Alive with Light

By Val J. Roper

[This article originally appeared in the National Lamp Works' magazine, "Light," published at Nela Park, Cleveland. Due to the unusual amount of valuable information it contains, and because of our desire to give our amateur readers the best there is, we are reprinting it through the courtesy of the Editors of "Light." Mr. Roper is himself an enthusiastic director and producer of home films.—Editor's Note.]

NEW stars in the movie heavens—hundreds, thousands, even millions of them! You and I belong to this great galaxy. So do our families, and especially the kids. Only a handful of this host of new heroes and heroines has been developed so far, but wait. Posterity shall see you in your true colors. Likewise Uncle Casper's nose will be revealed as faithfully as the sunset.

Val J. Roper

The home movies brought all this about. Heretofore the art of the cinema belonged to those who served it in the way of a profession, or (in news reels) to persons eminent in news or politics. Nowadays the humble man who's never been to Hollywood, nor ever won special distinction of any kind may keep his memories of pleasant days in living diaries which he may turn to in his reminiscent moods, or which he may proudly display to his friends.

Think of how often we endeavor to recall the happy scenes of childhood. Tomorrow's adults may refer to their visual records. They will be able to shed their years as they behold themselves again as boys and girls. Grandmas of the future will never feel very old when they can turn back time with the home movie and see themselves as children.

While the amateur movies admit us to stardom in the family film album, they also provide other thrills which are not to be overlooked. As directors and cameramen of our own productions we unearth hidden abilities and develop all our resources in art and drama.

All this is possible with a small movie camera, a projector, the safety 16-mm. width film, and a screen. This equipment requires only a modest expenditure; it has taken private movies from the category of a rich man's fad to a place in the average household comparable to that of the radio.

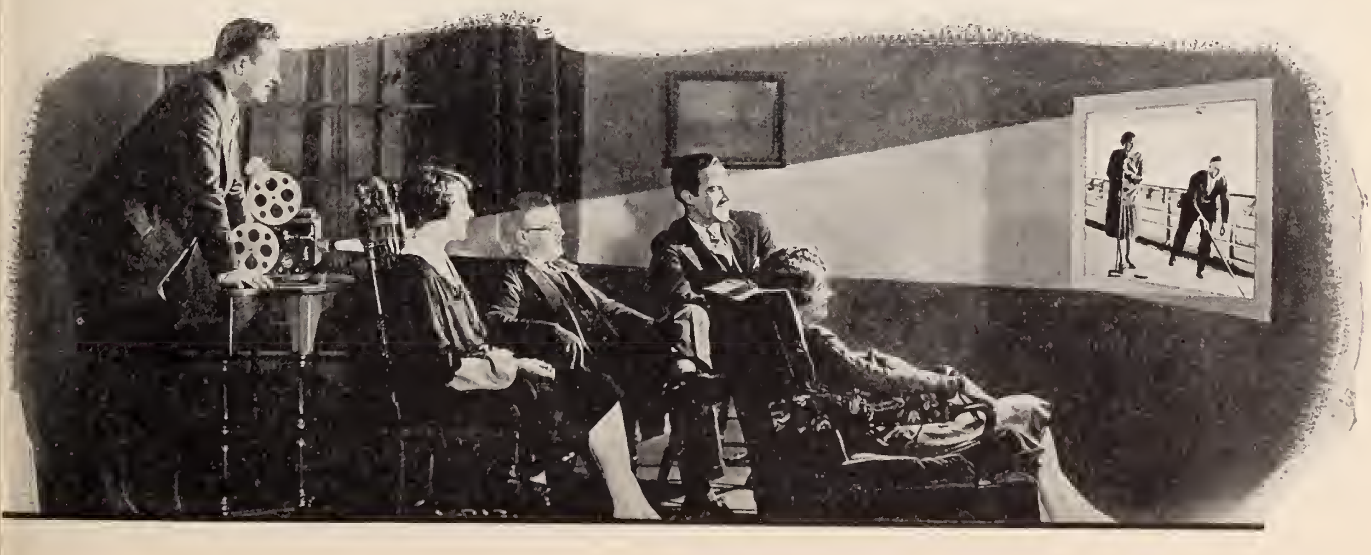
So thoroughly has the home movie equipment been developed for its purpose that excellent results are assured to the most inexperienced amateur. The camera may be loaded in daylight—of course not in direct sunlight—this task is almost as simple as that of loading your snapshot camera. Then to take the pictures, one need only to follow simple directions in setting the lens shutter opening for the brightness of the day; focus the lens for distance, if it is not the fixed focus type; point the camera at the scene to be "shot;" pick up the action in the view finder; and press the button, or lever. The film is developed for you and returned without added expense, ready to be threaded in your projector. Then with the turning of a switch, the pictures are automatically projected on your screen. This screen may be a sheet, a tablecoth, or a piece of white paper stretched on a wall, or it may be a miniature of the "silver screen" of the theater. The standard type of screen provides the brightest picture to be sure.

Of course the showing of motion pictures in the home is not limited to those taken by ourselves. To supplement the program and make it more interesting to our guests, we can rent or purchase from the local film library appropriate short subjects, newsreels, comedies, short features, travelogues,—practically anything that is shown in the large movie houses. Cost of subjects purchased outright averages very little higher than that of those we take ourselves.

The home field is just one of the large applications of non-professional movie cameras and projectors. The motion picture is now recognized as a valuable aid to the teaching profession, and as a most excellent dispenser of sales and business propaganda. While the larger standard 35-mm. width film with semi-professional and professional equipments must still be extensively used in these fields, the smaller 16-mm. width film and projectors employing it, because of their lower cost, relative simplicity of operation and extreme portability, are very popular here as well as in the home. They, together with the so-called film slide projectors, which for the shorter throws and smaller audiences supplant the bulky glass

Continued on Page 29

Proof of the joys of amateur moving making is in the showing. Now we may perpetuate actual incidents with thrilling veracity



Cino-Spectrometer

Continued from Page 21

The action of the above circuits in connection with the photo-electric cell is substantially as follows:

On increase or decrease of light the light sensitive material not only changes its resistence but causes an electron flow which varies the flow of electrons between the filament 23 and the plate 25 and hence varies the current in the work circuit indicated by the meter 35. If the changes of current are weak due to the effect of increasing or decreasing light, such factors may be compensated for by a sensitive adjustment of the meter on utilizing additional amplifying circuits if desired. I do not illustrate herein any external amplifying circuit as these are well known and commonly utilized in the radio, telephone and such arts.

In Fig. 5, I indicate a recording meter designated generally by the numeral 42 having a moving web of material 43 with a pencil 44 actuated by a meter 45; this arrangement usually requiring an amplifying circuit to actuate the meter 45.

The manner of using my cino-spectrometer as above described is substantially as follows:

The camera is focused on the scene to be taken in the usual manner, it being presumed that the lighting or the like is sufficient. The photo-electric cell is then placed behind the focusing lens and the amount of light received thereon interpreted by reading the meter 35 or a self-recording meter. If the light reflected from the scene is not sufficient or too much, if an in-door scene, the light may be changed. By utilizing a prepared table or chart the camera man then sets the iris of the camera and the shutter regulating mechanism in accordance with the setting designated corresponding to the amount of units of light designated on the meter. He may then photograph the scene, knowing that the camera is properly and scientifically adjusted to obtain the best results.

After a reel has been taken this is marked with insignia designating the light units under which it was photographed. If a reel has been used for several different scenes having different units, these would be indicated on suitable markings to give the proper information in the developing laboratory.

(To be continued in the June Issue)

New Color Process to Appear This Month

London—The Wolff-Heide color process which has been acquired for the world by the United Film Industries, Inc., of New York, will begin demonstrations by May. Regular cameras are used while the coloring is done via a secret chemical process.

Western Electric Challenges Foreign Sound Patents

Berlin—Western Electric has filed suit here challenging the validity of certain sound film patents of the Siemens-Tobis-Phototone combine. Lawrence Hermes of the Tobis combine stated that outside of America the combine is in a strong position as regards basic patents, holding patents of Tri-Ergon and Kuchenmeister, in addition to those already held by Siemens and A.E.G.

"Our position in Europe as regards sound film patents," he said, "is sufficient to ensure a practical monopoly not merely in Continental Europe but also in the British Isle and Empire."

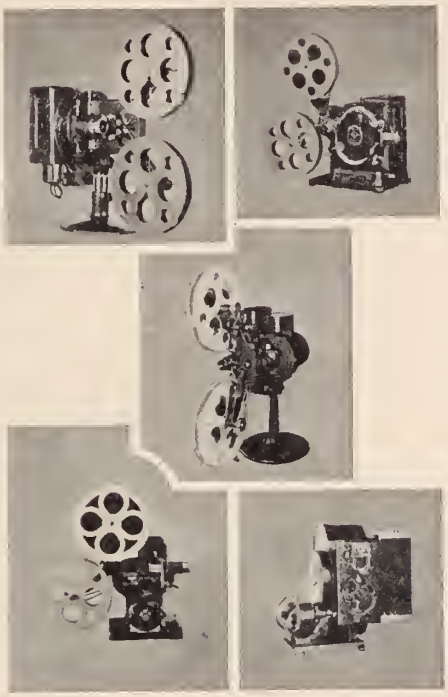
The Why and Wherefore of the Mazda Lamp

Continued from Page 7

effect on the lamp. If it is burned at a lower voltage than that for which it is designed the lamp falls off in candlepower very rapidly. On the other hand, if the lamp is operated above its labelled voltage, the life is shortened at a rapidly increasing rate. It is, therefore, essential for good lamp performance that the voltage of the operating circuit be held constant at the labelled lamp voltage figure.

slide stereopticon projectors, find application in the classroom and small lecture hall, and are the standard accessories of many traveling salesmen.

Along with the success of the amateur movie goes another chapter in the development of MAZDA lamps. These play a vital part both in the taking and the projection of pictures. A new line of standard projector lamps has been created to specially meet the requirements of the portable projector field. A new light source, and a special base and socket are incorporated in this new line of lamps which answer the requirements of every type of unit. Because of the smaller picture size of the 16-mm. safety film, the effective light source area is much less than with the large 35-mm. width film employed in the larger portable and standard theater projectors. Therefore, a highly concentrated filament must be used to give sufficient illumination. The wattage which can be employed is, of course, definitely limited as, with other factors constant, the source size increases with the wattage. Our extensive tests have proven that, at the present time, the 200-watt, 50-volt lamp gives the best average results in the 16-mm. film projectors. The 50-volt filament is more concentrated than the 115-volt filament of the same wattage, hence it is better adapted to the optical systems of these small projectors. The use of a 50-volt lamp necessitates a series resistance to reduce the circuit voltage to that of the lamp. In the case of the less expensive equipments where slightly lesser illumination can be afforded, it is desirable to use a standard circuit voltage lamp. As the ordinary coiled 115-volt filament is so large that its use would result in considerable sacrifice of light, a special double-coiled, or coiled-coil filament was developed for this service. The regular coiled filament is coiled again, resulting in a more highly concentrated light source which, in the case of the 220-volt lamps, gives 80 per cent of the illumination obtained with the 50-volt lamp in the 16-mm. equipments. No advantage is derived in double coiling the 50-volt filament.



Herewith are shown a group of excellent home movie projectors which, with the able aid of Mazda lamps, make the new family album throb with life.

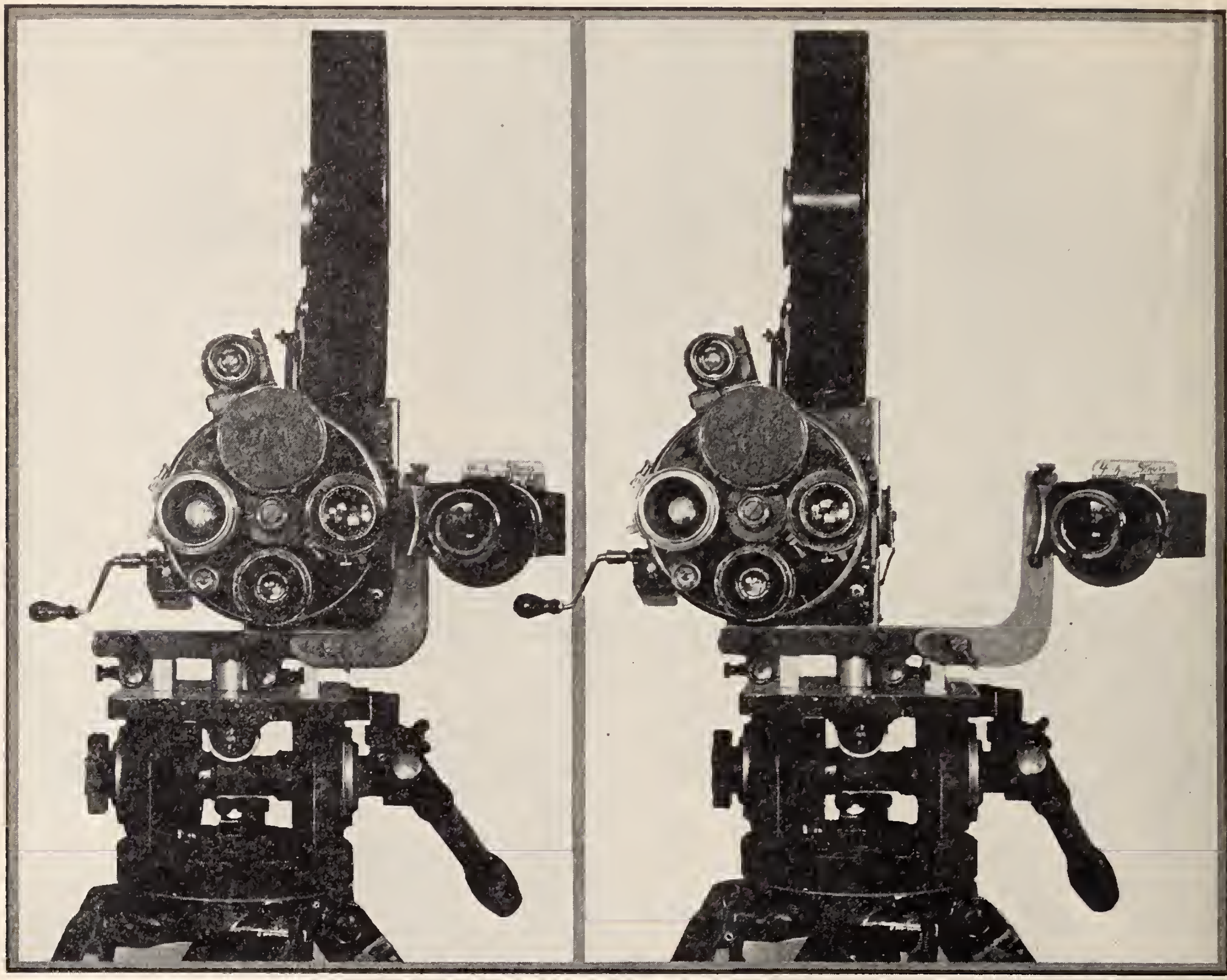
The 100-watt, 115-volt, coiled-coil filement lamp is used in the least expensive projectors which are applicable only to home use because of the comparatively low illumination obtainable with them. Home movies are ordinarily projected at night, in a totally darkened room; therefore the illumination requirement is not so stringent as in the case of movies projected in the daytime in the school room or business establishment.

As mentioned previously, the educational and business fields also employ the 35-mm. film equipment. Large class rooms, medium and large size lecture halls, require equipment capable of projecting a larger picture at a greater distance than is possible with the little 16-mm. film projectors, and the film slide projectors. Two lamps answer these higher illumination requirement, the 500 and 1000-watt, 115-volt, T-20 bulb types.

MAZDA lamps may also have an important role in the taking of the amateur motion pictures. They provide the most convenient light source for filming indoor or night scenes, and their use is especially desirable when panchromatic film is employed. Ordinarily, two efficient semi-matte finished reflecter units, accommodating either the

Continued on Page 31

"Shooting" a home scenario does not involve elaborate equipment. Two efficient reflectors with 1000-watt Mazda lamps and plugged into the home lighting circuit are the only accessories to the camera in this scene



Karl Struss, A. S. C., Invents New Device for Finders

Another A.S.C. member has given a new idea to the craft. Hardly a month passes but what one of the members contributes a new invention that is both practical and useful.

This time it is Karl Struss who offers his contribution in the form of a stationary arm or bracket which holds the finder permanently in position away from the camera.

A simple thing, after someone else has thought of it; and very useful if you have a director who likes to watch action through the finder.

The illustrations above tell the story more plainly than words. Struss took a Bell & Howell camera and had Fred Hoefner make the bracket and attach it. A Mitchell finder was added—and there it is. When the camera head is swung over to the finder as the cameraman is lining up there is no difference between this and the old system. But when the camera head is swung back into place the finder remains as in the right figure above.

Struss says he will not patent this, but offers it to all the members of his craft.

Mazda Lamps With Cleaners

Continued from Page 16

of the lamp, and thus there is very little change in the amount of light obtained from the lamp during its life.

The accompanying illustrations show very clearly the advantages of this cleaning process. (While the lamp illustrated is not a studio type, nevertheless the effects are similar in the 5 and 10-kw. lamp designed primarily for studio lighting service.) The pictures listed as "A" illustrate a lamp which has been operated for six 25-hour intervals. The progressive blackening is very evident and it is obvious that the light output is materially lower towards the end of its life. Bulbs B and C show another lamp, B before it has been cleaned, and C after it has been cleaned. It is quite apparent that there is practically no loss of light due to bulb blackening in the lamp which incorporates this new scouring material.

Coincident with the development of this mechanical cleaner, improvements have been made in the "sag" characteristics of the filament wire so that even though the filament is operating at a higher temperature, the tendancy of the light source to distort or "sag" is even less than heretofore.

The enormous advantage to the motion picture studios resulting from this development involves savings not only in energy and lamp costs, but also in equipment. For "close-ups" the individual equipments will give more uniform performance and the cinematographer will obtain even more uniform photographic effects. For the larger sets, four equipments with the improved lamps can be used to give the same amount of light as was heretofore obtained from five, often an important feature in the placing of the units to obtain desired effects.

Australia

Production of sound and talking films will soon be undertaken in Australia, according to the announcement made locally by a representative of a large American producing company.

Everybody's in the Movies

Continued from Page 29

500 or 1000-watt tubular bulb projector lamps, serve the requirements of the amateur.

All of the standard line of projector lamps are available with the prefocused base for use in equipments fitted with the prefocus socket. The filaments are accurately aligned with respect to the base at the lamp factory, hence no focusing adjustment is required in the projector. This greatly simplifies the operation of the projector and results in better average illumination, since the filament is more apt to be in its correct position on the optical axis.

Thus do MAZDA lamps contribute to another instance of modern conquest of ancient impossibility, to the magic whereby ordinary men may perpetuate certain hours of their experiences.

Approximate Illumination Intensity Required to Take Pictures at the Rate of 16 per Second

Lens Speed	Foot Candles
F1.5	85
1.8	123
1.9	137
2.3	200
3.5	460
4.5	760
6.5	1600
8.	2400
16.	9700

DeVry and Q. R. S. Merge

In line with the trend of modern business is the merger of two of the strongest concerns in the amateur motion picture field—Q. R. S. and The DeVry Corporation. This brings into combination the unusual financial resources of Q. R. S. with the outstanding manufacturing ability of The DeVry Corporation in this particular line.

Q. R. S. has achieved its wonderful financial success in a somewhat different though closely related field, and has only lately entered into the motion picture industry. So that especially fortunate is its consolidation with The DeVry Corporation, which during the last 15 years has occupied a dominating position in the manufacture of portable motion picture cameras and projectors, both in this country and abroad.

The DeVry Corporation, as organized and developed by H. A. DeVry, is well known for its vision, ingenuity and the ability of its personnel. It produced the first successful portable motion picture projector and has since kept not only abreast of the improvements in the line, but has consistently led the field in many important respects.

The amalgamation will enable Q. R. S. to transfer all of its motion picture activities to The DeVry factory, under the active management of H. A. DeVry and his experienced associates. The new financial resources now placed at the disposal of the motion picture end of the business enables the completion within the year of plans which are regarded as years ahead of the achievements thus far recorded in this field.

The new company will now face the market with the most extensive line of motion picture apparatus ever offered the trade by one organization. It will include the whole range of motion picture machinery from the least expensive movie camera retailing at $39.50 to the highest priced combination talking movie outfits for home and business.

The Canadian Goverment Motion Pictures Bureau is planning to move its quarters to a bigger and more appropriate building on the outskirts of Ottawa and to acquire new camera and laboratory equipment for the 16 mm. substantial film size.

The studios and laboratories will be so equipped as to permit the making of pictures of educational and scientific interest such as microscopic and slow motion pictures.

COLOR FOR THE AMATEUR

Some timely information for home movie makers on problems facing them when they want color.

By MAX B. DU PONT, *Inventor of Vitacolor*

IT HAS been quite a satisfaction to the amateur to be able to make his own moving pictures during the past few years, even in black and white. Shooting pictures is practically ranked as a sport and not only a sport leading to the outdoor life, but, leading to higher ideals and to the better understanding of the wonders of Nature.

Up to the present time the amateur has had his mind trained to think of a black and white reproduction of Nature, but with the discovery of Vitacolor this has become a thing of the past. Vitacolor will give to the amateur the colors of Nature on the screen. Can you imagine a scene at the Grand Canyon with the ever changing colors, or a glorious sunset on the desert!

To help the amateur in getting the best results in color photography, it is necessary for him to know that when shooting Vitacolor he is only recording on the film black and white values of reflected light consisting of a considerable range of wave length, or in other words, ordinary colors are recorded on the Vitacolor panchromatic film by the selective reflection of the object itself, and the segregation of the said various rays reflected by the object is done by the Vitacolor filter.

The mechanical action of the Vitacolor filter could easily be compared to a wireless receiving station which is tuned to respond to the various wave lengths composing the natural light. This electro magnetic theory of light has been lately received with much favor and is regarded as an electromagnetic phenomenon.

Max B. Du Pont

A. S. C. Member, and inventor of Vitacolor, who will be ever ready to answer color problems for our amateur readers.

The Dielectric medium is concerned to be subject to a rapidly periodic electric displacement, the variations of which have the magnetic properties of an electric current. In the meantime, the electromagnetic theory is very instructive and shows us what unlimited field is open to our imagination.

When light reaches the surface of an object susceptible of reflection which is the rebound of light-waves from the surface on which they are incident, it either penetrates beneath the surface or it rebounds directly from the surface with more or less absorption, so the degree of coloration of the object depends on the amount of rays partially or totally absorbed by the object. This is the reason why a red flower appears red, because the white light falling on it penetrates the cells of the petals which absorb the green and some of the blue constituents of the light while all the red, orange and a very small amount of blue are reflected back to the eye; the fact being that the coloration of an object is due to its reflecting and absorbing power.

It is interesting to know that a bright red object will reflect nearly all of the incident red light, while a bright green object will only reflect about one-third of the green light, and a bright blue object one-fourth of the blue light. A red object will be the brightest; a green object less bright; and a blue object darker. A yellow object reflects even more red light than a red object, and much more green light than a green object.

As a rough guide to correctness of exposure: The photographer should take into consideration the above chart of reflecting power of differently colored objects, especially when making color study of subjects of an extremely predominant hue.

In order to produce artistic effects, a few of the following hints may help the amateur Vitacolor cinematographer. Remember to avoid large areas of the same color. Bright red and vermillion requires the greatest judgment in photographing. There is very little red in nature; bright red and orange have a stimulating effect on the senses, while greens are especially restful to the eyes; blues give a very pleasing effect and always contribute to the harmony of the picture.

The color composition in color photography is as important as in an oil painting. Soft shadows are useful to give depth and illusion of stereoscopy. The lighting of the subject is of great importance, and its effect should be carefully studied. Side light, flat light, will generally give very pleasing pictures. For back lighting the use of reflectors is recommended. Avoid allowing the sun to shine on the filter attachment, or it will spoil the picture, causing flare and fog.

For portraits a suitable background of a darker shade than the model will improve the results. If shooting in bright sunlight a small diffuser as a piece of muslin held between the subject and the light will produce a beautiful effect.

The Vitacolor process of color photography will give the amateur the satisfaction of producing pictures of full individuality and will always contain evidence of the cameraman's soul and inspiration, and will rank his efforts as a real artistic achievement.

Gennett Synchronous Systems Now on the Market

Another sound on disc device has been added to the constantly increasing number now on the market. This one is called "The Gennett Synchronous System," and is a product of the Starr Piano Company, of which Fred Gennett is president.

Many months of experimenting have now been completed and Mr. Gennett announces that arrangements have been completed at his Richmond factory for a stupendous production of this device. The machine will be distributed through all Starr Piano agencies.

Mr. Gennett made a trip to the Pacific Coast, where he appointed W. T. Norton as Western supervisor, with headquarters at the offices of the Starr Piano Company, 1344 South Flower street, Los Angeles.

Mr. Norton explains that the Gennett Synchronous System is not a machine "that has been rushed on the market to take a profit advantage," but is a substantial working mechanism, "which reproduces the voice in perfect synchronism with the motion picture."

One of the attractions of this new device which is being stressed by the company is a system of sound absorbers which are said to prevent the picking up of practically all noises generally attendant in motion picture projectors, and is said to eliminate machinery vibrations.

Carry This Movie Camera In Pocket

One of the smallest motion picture cameras ever offered for sale in Los Angeles has been received by the Photographic Department of the Marshutz Optical Company. This newest of Cine-Kodaks is no larger than an ordinary novel and weighs but three pounds. Holding 50 feet of 16 m/m movie film, it provides the first real lightweight pocket type amateur motion picture camera offered at a popular price.

Recent Releases of A. S. C. Members

"It Can Be Done"—Universal—Ross Fisher.
"Strong Boy"—Fox—Joseph August.
"The Eternal Woman"—Columbia—Joseph Walker.
"The Wild Party"—Paramount—Victor Milner.
"Molly and Me"—Tiffany-Stahl—Frank Zucker.
"Queen of the Night Clubs"—Warners—E. B. DuPar.
"The Iron Mask"—United Artists—Henry Sharp.
"The Sin Sister"—Fox—Charles G. Clarke.
"The Devil's Apple Tree"—Tiffany-Stahl—Henry Sharp.
"The Silent Trail"—Syndicate Pictures—Paul Allen.
"New Year's Eve"—Fox—Conrad Wells.
"The Shakedown"—Universal—Charles Stumar.
"Alibi"—United Artists—Ray June.
"Coquette"—United Artists—Karl Struss.
"Through Different Eyes"—Fox—Ernest Palmer.
"Seven Footprints to Satan"—First National—Sol Polito.

Another Use for Movies

Criminals are the "stars" of motion pictures now being filmed in large eastern cities. Detectives and police executives are the directors and cameramen.

The movies are not taken for amusement, but for the purpose of recording the walk, mannerisms, as well as the general characteristics of wanted criminals. Copies of the films are sent to police headquarters throughout the country.

According to Gordon Gribben, photographic technician at the Marshutz Optical Company, the amateur motion picture provides an amazingly effective method of aiding the man-hunting game, as practiced by detectives throughout the world.

DEATH CLAIMS E. BURTON STEENE

E. BURTON STEENE, A. S. C., one of America's pioneer aviation cinematographers, will never again climb into the cockpit of a plane to defy death as he photographs the hair-raising deeds of the actors in an air picture.

Never again will he sit in the quiet of the projection room and watch the result of his efforts as they are thrown on the screen at the close of a day in which he has courted death for the sake of his art.

Burton Steene is dead.

On Sunday, April 21, he answered the call of the Grim Reaper, following an illness of one month. Heart trouble was the cause. He was laid to rest on the evening of April 24, after final tribute had been paid at the chapel of the Hollywood Cemetery.

Mr. Steene was one of the most notable figures in the cinematographic world. Away back in 1911 he broke into the movies by the route of news editor of the Pathe Weekly, the first news reel in America. He traveled for this firm as staff photographer and as such saw excitement such as few men are privileged to see.

E. Burton Steene

His first picture from the air was made in 1912 over Lake Ponchartrain, near New Orleans. This was followed by years of service in which he was found shooting air scenes for practically every big air production. During this long and useful career Steene flew with practically all of those early fliers who have made aviation history.

Among these fliers were Lincoln Beachey, who was killed in 1915; Art Smith, who lost his life in the mail service; Katherine Stinson and many noted army and navy fliers. When Brigadier General Charles F. Lee of the Royal Air Force came to America at the head of the British Air Mission he acted as pilot for Steene during the making of a five-reel picture for instruction of cadets and students. General Lee was killed in 1919.

When the real history of motion pictures is written some time in future years, and cameramen are assigned their true place and are clothed with the importance that is theirs, the name of E. Burton Steene will be placed high alongside those other courageous members of the A. S. C. who have pioneered in cinematography and have gone cheerfully "against the guns."

A. S. C. Elects Officers

AT THE annual meeting of the American Society of Cinematographers held Monday night, April 1st, the new Board of Governors for the coming year were elected. On Friday, April 12th, the new Board organized by election the following officers:

John F. Seitz, President; Victor Milner, First Vice-President; Alvin Knechtel, Second Vice-President; Arthur Miller, Third Vice-President; Fred Jackman, Treasurer, and Charles G. Clarke, was re-elected as Secretary.

The retiring President, John W. Boyle, was elected to the Board of Governors. The other members of the Board consist of John Seitz, Victor Milner, Charles G. Clarke, Fred Jackman, Harry Perry, L. Guy Wilky, Alvin Knechtel, Ned Van Buren, Hal Mohr, Dan B. Clark, Arthur Miller, John Arnold, Ross Fisher and Sol Polito.

Mr. Seitz, the new President, has a long and honorable record as a cinematographer with many notable pictures to his credit. He is a born leader and a man who inspires the greatest confidence in his ability to carry out the high aims and ideals of the Society which he heads. The new President is personally popular among the rank and file of the A. S. C. and his administration will have the solid support of the entire membership. In the next issue of this magazine the future policy of the Society will be outlined by Mr. Seitz at some length. Mr. Seitz has a great many really constructive plans for the organization which should be of extreme interest to every one connected with the motion picture industry.

The formal installation of the new officers took place April 22nd, at the Hollywood Athletic Club, with Daniel B. Clark, past president, presiding. An informal dinner preceded the installation.

During the last quarter of 1928, 229 Educational films were submitted to the German censorship.

Patent Troubles Abroad

Berlin.—Litigation has arisen between German "Tonbild-Syndikat" (Tobis) and the "Klangfilm Company," a subsidiary of A. E. G. and Siemens & Halske. Recently a tradeshow was held in one of the largest cinemas of Berlin by the Klangfilm Company where both soundfilms with synchronized records and sound-on-film reels were shown. Some of these reels were of American origin (R.C.A. Photophone) while others were of Klangfilm experimental production. On the same day Tobis was granted a court injunction against Klangfilm prohibiting the import and production of Sound Films in which picture and sound photographs were separately shot and developed to be ultimately united in the printing process. It need not be explained that this procedure is of fundamental importance as it presents the only solution of the intricate problems involved. The Tonbild-Syndikat was able to obtain this injunction for infringement of their patents against the Klangfilm Company as these patents present one of the chief elements of modern sound film production. It will be remembered that these patent rights were originally granted to Tri-Ergon Company and subsequently have become property of Tonbild-Syndikat after the merger. This injunction is applicable not only to Sound-Films of German production, but naturally to all such films of foreign make, whether shown by the Klangfilm Company or others. At the same time the Tonbild-Syndikat has brought an action against the Klangfilm Company for infringement of patents and damages. As matters stand 'Tobis' seems to have complete control of sound-on-film production in Germany, as practically all such films are manufactured by a separate process, such as 'Movietone' and similar systems.

German Scientist Remarkable Figure at Age of Seventy

Perhaps one of the most active figures in the scientific world who is devoting his time to the development of photographic appliances is Dr. Rudolph, outstanding German scientist connected with the firm of Hugo Meyer & Co.

Dr. Rudolph celebrated his 70th birthday last November, but daily he toils for hours in his laboratory near Goerlitz, Germany. He is a man of tireless energy and erect bearing and is constantly working on new ideas for photographic improvement.

Born November 14, 1858, in Kla, Thuringen, he studied in Munchen, Leipzig and Jena and in 1884 was awarded the degree of Doctor Philosophy. He taught higher mathematics at the University for a short time and then became associated with Prof. Abbe, who at that time was connected with the firm of Carl Zeiss in Jena and whose research was largely responsible for improving the quality of optical glasses. Following this, Dr. Rudolph spent several years in the Microscopical Department and in 1890 he invented the first Anastigmat lenses. Until he was pensioned, he was the head of the Photographic department at the Jena works. Aside from the Protar and Anastigmat F:6.8 sets in 1891, he brought out in 1895 the Double and Protar sets working at F:6.3, in 1897 the Planer and Amorphoten, in 1900 the Unar and in 1902 the celebrated Tessar which has become one of the world's standards.

Because of overwork brought on by long hours in the laboratory, his health broke down and he was compelled, in 1910, to retire to the country to regain some of his spent strength. However, his brain was too active to remain in idleness for any length of time and the years between 1910 and 1918 were really the most fruitful of his career, for—

In 1918, after years of study, he invented and patented the first Anastigmatic Sphero-Achromats, which he termed Plasmats. His object was twofold, firstly to construct a faster convertible lens than hitherto considered possible and secondly, the fuller correction for the primary colors of the spectrum which, because of their fuller color correction he termed Sphero Achromatic. Their construction makes possible the focusing on the same plane of the blue and yellow rays.

The firm of Carl Zeiss of Jena made the first tests, but because of previous license arrangement, could not manufacture, for Hugo Meyer & Co., of Goerlitz, had taken over, under license agreement with Dr. Rudolph, the Plasmat patents and had further agreed to take over all his future developments in the years to come.

Dr. Rudolph moved his laboratory to Gros-Biesnitz near Goerlitz in order to be near the works of Hugo Meyer & Co. In 1922, Dr. Rudolph announced the Kino Plasmat F:2, in 1924 the Marko-Plasmat F:3 (free from spherical zones) which is a perfect Sphero Achromat and in 1926 he electrified the industry by his announcement of the first Kino Plasmat working at the hitherto considered impossible speed of F:1.5. This is a worthy achievement for this celebrated physicist, answering as it does the insistent call for the moving picture industry for speed and is conclusive evidence of the high correction of his entire Plasmat series.

In 1924 he also patented the three-color photo apparatus which freed high speed photography from the objectionable Parallex and which also seems very satisfactory for motion picture work.

The Face on the Cover

A few facts about the first man to appear on the cover of this magazine

FOR ten years the American Cinematographer has adhered to a policy of no faces on the cover. However, times change and with them policies. With this issue the cover policy of this magazine changes and the first face to appear on the cover is that of Ian Keith, an actor whose ability on stage and screen has placed him in the front ranks.

Mr. Keith was born in Boston. His father, William A. Ross, was a well-known inventor. Ian was christened Keith Ross, but took his stage name from his mother's family.

From earliest boyhood Keith was an ardent and avid reader of Shakespeare. While preparing to enter Harvard family financial reverses made it necessary that the young man take a position in a book store in New York. There he fairly lived with his Shakespeare, and through a friend won a scholarship in the Sargent School of drama, from which he graduated at the age of eighteen. But the war was on and he went into the Merchant marine service.

After the war he made his debut in stock in Memphis, Tennessee. The company went on tour and Keith learned 21 Shakespearean plays. Keith next appeared in New York with William Faversham in "The Silver Fox." Frohman saw him and placed him as male lead in "Czarina." "As You Like It" was his next. Then he stepped into "Laugh, Clown, Laugh," in which Lionel Barrymore was playing. This engagement ran a year in New York.

It was while playing in this production that Gloria Swanson saw Keith and selected him to play opposite her in "Manhandled" and "The Queen's Love Story." These were followed quickly by "Love's Wilderness" and "Enticement." Keith then went back to the stage and appeared in "My Son," "Master of the Inn," "An Ideal Husband," and "Monna Vanna." He sandwiched two pictures in with these: "The Prince of Tempters" and "Convoy." Hollywood again called him and he played in "Two Arabian Knights." He and his wife, Ethel Clayton, then toured the middle west in his own stage production, "Firebrand."

Returning again to Hollywood, he played in "A Man's Past" and with Corinne Griffith in "The Divine Lady," and in "The Street of Illusion." Again he went to the middle west with his wife in "The Copperhead" and "The Ideal Husband."

Early this year he returned to Hollywood to play opposite Miss Griffith in her first Vitaphone effort, "Prisoners." It was also Keith's first appearance before the microphone. His work was of such a high standard that First National immediately signed him to a contract to make three more Vitaphone productions, the first of which will be "The Great Divide."

Keith has a remarkable speaking voice and a startlingly brilliant future in talkies is predicted for him.

"More credit should be given the cinematographers," declares Keith. "Where would a player be if it were not for the genius of these men who light us and photograph us. The trouble is that their own light is hidden too much. They are real artists and should be given infinitely more credit for their artistry. They are my friends—and there are none better."

Mechanical Genius Heads Cinema Equipment Company

Now and then one discovers a mechanical genius who seems able to produce anything that one desires, whether it has ever been built before or not.

Nowhere in the world are there more of these men than in Hollywood, for it is in the world's film capital that the impossible is always being done—and at a moment's notice. When the picture producers decide they want something they want it right away, and there can be no such word as "can't."

One of these men who apparently can do anything of a mechanical nature is Captain Ralph G. Fear, head of the Cinema Equipment Company. Captain Fear has been designing new cinema equipment for years, and very few persons think about the unusual ability of the man because he makes the impossible appear so easy.

About a year ago he opened his new factory, after years of work with the various companies as a mechanical engineer. And in this one year he has placed new pieces of equipment upon the market. These new products include friction tripods, high speed movement for Bell and Howell cameras, automatic clutches, motor and clutch adapters and a new developing machine.

This newest product, the Fearless Simplex Developing Machine, has just been finished and installed at the M. G. M. studios. Captain Fear declares that this machine successfully processed film without a single break from the time it was first threaded and without weeks of experimental work and change in construction.

Captain Fear designed many mechanical products while with Paramount, including a high-speed developing machine which has been in continual use for six years. Among other mechanical apparatus designed by Fear are optical printers, inspection machines, geared panoramic tripods, color printing machines, title machines. He designed the Fox Case Grandeur film camera, the Handschigel color camera and a natural color camera. At his own factory he is designing and building all the impossible contrivances that are demanded.

Dawes Turns Waste Into Profit

Opportunity is always around the corner for those who have good eyesight. Take the case of Fred Dawes, of 1426 Beachwood Drive, Hollywood. He has taken advantage of a condition brought about by the talkies and has built up a remarkable business.

The business is that of taking studio negative "shorts" and turning them into "longs," as it were. Studio negative shorts, it must be explained, are created when a cameraman in a dark room following his completion of a scene or when he reaches the conclusion it will be unsafe to go into another scene without reloading, removes from his camera magazines all of the film in it. The exposed film is put into a can and sealed for shipment to the developing laboratory.

The unexposed film, if there be an appreciable length, is put in another can and sealed and marked "shorts," with the length and type of film and name of manufacturer added. Since the coming of sound photography the ends have materially increased in length. In the first place the rolls have been made 1,000 feet long against the former rule of 400 feet. One reason for this is that dialogue scenes on the average run longer than silent ones. Vocal sequences in which the camera does not have a chance to stop turning have run as high as 800 feet.

If the scenes are 500 feet in length, with another long one to follow, the cameraman will not dare go into it with but 500 feet of negative in his mounted magazine. Consequently his only protection is to remove the 500 unexposed feet and replace the negative by a roll of a full 1,000. The short is laid aside. When next it emerges from the can it is in Dawes' testing laboratory, where an examination will be conducted to make sure the roll has not been touched by the light and that also it is in perfect condition.

Of course not all the shorts that come to the testing laboratory are 500 feet. The lengths range from 50 feet up to the sum named, which is unusually long. But there are many of 100 to 400.

By the aid of an electrical splicer the longer shorts that successfully have emerged from the test are made into lengths of 400 and 1,000 feet. Others correspondingly shorter are made up into rolls of 100, 200 and 300, the idea being that there shall be few splices. The splicer employed, it may be added, does its work so effectually that the joined film will pass without hindrance through the magazine of any camera.

During the past year Mr. Dawes has sold more than a million feet of 25 mm. shorts to news weekly men, commercial photographers and even producers. Orders were filled from every state in the Union. That record was achieved as a result of a business development opened in that particular field in four years. Formerly it was the custom of studios to send shorts to the exchanges of their companies for use as leaders or trailers on positive films in order to protect the printed section at each end from damage in threading up the projector. Now the damaged shorts answer that purpose.

A. B. C. of Sound Pictures

Continued from Page 26

say, it aroused the interest of the scientists and researchers, but remained within the realm of laboratory experiments.

It is quite necessary that we now depart temporarily from the field of sound and photographic analysis and synthesis in order to rapidly survey developments of a different nature but which were called to play an extremely important part in sound pictures. We refer to the transmission of sound over a distance. The ever-increasing knowledge on elecro magnetism led Graham Bell, in 1876, to the invention of the telephone.

The basis upon which this apparatus was constructed was the known fact that a magnet can produce induced currents in a metal circuit. Graham Bell wound a coil of wire around the pole of a permanent magnet, leaving certain space between it and the coil. In front of the magnet and at a small distance he placed a thin disc of soft iron which could be set to vibrate by sound waves impinging upon it even as the diaphragm in Edison's phonograph. The coil was extended by two wires connecting a similar instrument set at a distance, one of the wires being most of the time substituted by the earth.

Now, if a magnet is held stationary in a wire coil, no effect is produced, but if the magnet is rapidly withdrawn or introduced in the coil, or if a change is brought on its magnetism, electrical currents are developed in the coil itself sufficient to be detected by a galvanometer.

The necessary variations of magnetism are introduced into the permanent magnet of the telephone by the vibrations impacted to the diaphragm when sound waves strike it. The current thus produced flows in alternate direction, and since the diaphragm itself becomes magnetized by induction its varying positions also give a rise to an alternating current in the coil, which flows in the same direction as the current produced by the permanent magnet.

These currents are transmitted through the wires to the second apparatus, the diaphragm of which when used as a reproducer, that is to say, sets in motion the particles of air surrounding it, this motion is necessarily equal to that imparted to the air particles by the sound vibrations at the transmitting end, and therefore are a reproduction of these same vibrations, which the ear detects as sound.

The above brief and purposely simplified description of Graham Bell's telephone is but an introduction of new elements without which the modern art of sound synchronized pictures could not exist.

(To Be Continued in June)

Photographer's Association of America to Convene at Buffalo This Month

Buffalo, N. Y., has been selected for the forty-seventh annual convention of the Photographers' Association of America, week of May 20th.

Every phase of the photographic field will be covered in the large number of interesting papers scheduled for the meeting. Eighteen papers are listed on the program, covering everything from selling pictures to discussion of the effect of the modern movement on photography.

Advance information indicates a record attendance. Edgar Guest, poet-philosopher, will be chief speaker at the annual banquet.

New Projector

The Bell & Howell Company is stressing the desirability of its Filmo 5-E School Projector for use with 16 mm. films in educational institutions. This model is based on the new model Filmo 250 Watt Projector, recently perfected, which has been very successful in the home field. Adjustments which increase its adaptability to the special problems of school projection have been made and the company reports that immediate popularity has greeted this latest adjunct of visual education.

Fred Archer Heads Warner's Portrait Department

Fred R. Archer, A. S. C., has just taken over the portrait department at Warner Brothers' studios, and once again will devote his time to photographing the stars.

Archer formerly was with De Mille and then spent five years with Universal, where he headed the title department and gained fame by being the first man to use animated titles. For the past year he has been in commercial work.

Agfa Announcement in June

Agfa discloses the information that an announcement of unusual importance to the film world will be made by their organization in the June issue of **The American Cinematographer.** It has to deal with a new panchromatic stock, but no details have been given out as yet.

During January, 1929, 426 studio days were fully and 94 studio days were partly occupied out of the 552 studio days available.

Imp-Impregnator

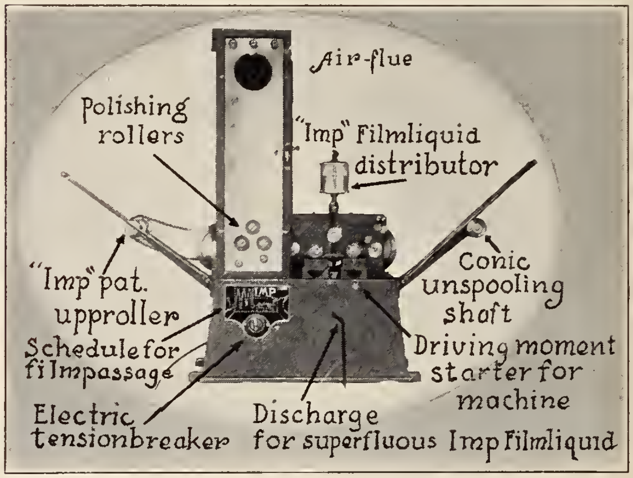
(Contributed)

Helsingfors, Finland:

A. B. Film Machinery O. Y. of this city has perfected a film impregnator which promises to meet with great success among those people and firms who are interested in the prolongation of the life and usability of film. The machine, herewith represented, is guaranteed to renovate film without laboratory handling and to supply the simplest possible method for keeping film copies in good condition.

As is shown in the accompanying illustration the construction as well as the size of the machine is especially indicated for home work, owing to the fact that the machine is compact and easily handled. The impregnating liquid is not inflammable; it attacks neither gelatin nor celluloid surface, keeps the film flexible and removes all the scratches.

The IMP-Impregnator machine is able to handle 2,000 meters of film in one hour. It cleans, impregnates and polishes the film on both sides. The polishing rollers, 5 cmtr. in diameter and covered with felt, can be changed and



placed in the drying chamber. A strong airstream passing an oil filter enters the drying chamber and effects quick drying of the impregnated film, taking away at the same time all dust from the polishing rollers.

IMP-Impregnator machine cleans, impregnates and polishes both new and old film copies, and is especially effective for sound films. Owing to the fact that the expense of renovated and impregnated film per meter does not amount to more than the fraction of a cent the IMP-Impregnator should be one of the most useful machines in the industry.

The construction of IMP-Impregnator is the result of 15 years of experimentation, and it depends on a profound knowledge of film fabrication and distribution as well as of technical questions and especially is founded on experience in the theatre business.

IMP-Impregnator means progress—it has come out from the practice and is destined for the practice.

Characteristics of Motion Picture Light Sources

Presented at the Hollywood Meeting of the S. M. P. E., April 9, 1928 — An Abstract

By Loyd A. Jones and M. E. Russell

A paper dealing with relative visual and photographic efficiencies of illuminants[1] was published from this laboratory some years ago. This was followed by a communication in which the use of artificial light in the motion picture studio was discussed.[2] Since that time considerable progress has been made in the production of artificial light and many new and improved light sources have become available for use in the studio. During the past two or three years great improvement has been made in the photographic materials applicable to motion picture work, both with respect to the total or white light speed and from the standpoint of the sensitivity to all of the wave-lengths of radiation within the visible spectrum. The data relative to the photographic characteristics of illuminants published in the communications mentioned above covered the field very satisfactorily at that time, but in order to bring this information up to date, it now seems desirable to publish further information applying particularly to the more modern light sources and photographic materials. That these values may be of immediate practical use the measurements have been made by a very direct experimental method. It seems desirable, however, before taking up the discussion of this method and the results, to consider briefly some of the theoretical relationships involved in the determination of the photographic characteristics of a light source. For a more complete treatment of this phase of the subject reference should be made to the previous publications.

When radiant energy, the stimulus, acts upon the retina of the human eye a sensation, the response, is produced to which the term **light** is applied. In general this sensation is characterized by three attributes: **hue**, **saturation** and **brilliance**. The magnitude of the brilliance factor of the sensation produced depends upon the intensity of the radiation, which in turn is determined by the amplitude of the vibrational motions that constitute the radiant energy. The hue and saturation attributes depend upon the relative proportion of the various wave-lengths present in the radiant energy. Since the retina is sensitive to only a certain limited range of wave-lengths those lying between 4000 and 7000 mu), and since the brilliance sensation produced by equal intensities of radiation of the various wave-lengths within this region varies in magnitude, it follows that the total brilliance sensation arising from the simultaneous action of radiation composed of many different wave-lengths (such as light from the sun, electric arc, incandescent tungsten, or in fact any commercially useful light source) will depend upon two relationships: (a) the sensibility of the retina to radiation of various wave-lengths, and (b) the intensity of the various wave-lengths composing the heterogeneous radiation.

The reaction of a photographic material to radiant energy may be considered similar to that of the retina. As in the case of the eye, the stimulus is radiant energy, but the response (analagous to sensation) produced has but a single attribute which may be termed **blackness** instead of brilliance. The response of the photographic film is entirely lacking in attributes analagous to those of hue and saturation (the chromatic attributes). Moreover, the photographic material in general responds to wave-lengths of a different range from those that are capable of stimulating the human eye, and even in the case of those materials which are sensitive to all of the wave-lengths within the visible spectrum, the relation between sensitivity and wave-length is very different from the case of the eye. The magnitude of the photographic response (blackness) to radiant energy is dependent (as in the case of retina), however, upon two relationships: (a) the sensibility of the material to radiation of different wave-lengths, that is its spectral sensitivity, and (b) the intensity of the various wave-lengths composing the heterogeneous radiation.

In the simplest possible case, that is where the radiation from the light source travels directly to the photographic material or eye, without passing through or being reflected by any medium capable of changing its quality (spectral composition) by selective absorption, a knowledge of three fundamental relationships makes it possible to compute directly the value of both visual intensity and photographic intensity.

[The authors express here the theory of the three fundamental relationships — "Retinal characteristic," Photographic characteristic," "Light Source Characteristic" and the formulae related to them, expressing the "visibility of radiation," and the "spectral sensitivity of the photographic material" and the "spectral distribution of energy" from which the "visual efficiency" can be computed and expressed in form of equations, care being taken of the absorption of the photographic lens. This theoretical data is omitted in the reprint of this article and the reader is referred to the original text for more complete information.—Editor's Note.]

While the use of the relationships for the determination of visual and photographic efficiency are ideal from the theoretical point of view, many difficulties are encountered in their application to practical problems. The chief obstacle lies in the lack of available data and in the experimental difficulties encountered in obtaining sufficiently precise data relative to the spectral distribution of energy from the light sources of commercial importance. However a thorough understanding and appreciation of these fundamentals is of the utmost value to the worker in this field, since even with the approximate data available it is possible to draw conclusions as to the relative efficiency of various light sources when used with photographic materials of differing sensitivities.

In view of the difficulties of obtaining sufficiently precise data to permit the application of the principles discussed in the previous paragraphs, it was decided to adopt a direct experimental method for measuring the photographic characteristics of the studio light sources. The procedure followed was designed specifically to transferred to a circuit which includes a storage battery powerful electomagnets, and the slightest fluctuation in the current passing through it causes considerable distortion. A beam of light from a powerful arc lamp rigidly mounted at the rear of the camera, passes through the obtain data of practical value and to this end the measurements were made as nearly as possible under conditions similar to those existing in the average motion picture studio. In comparing the efficiency of light sources it seemed desirable to divide the work into two rather distinct parts: the comparison of efficiency (a) with respect to the rendition of the white, black, and gray objects, the achromatic colors, and (b) with respect

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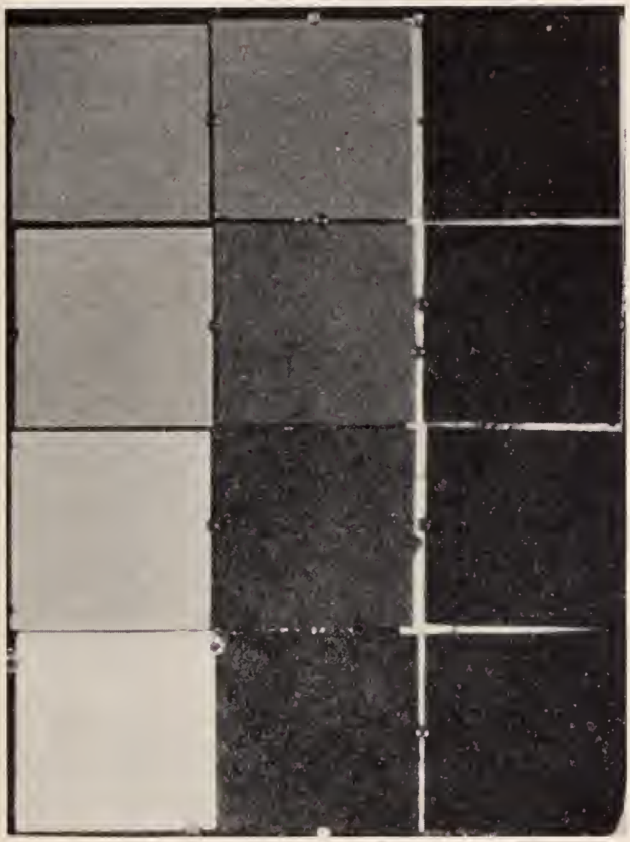
to the correct tonal rendition of colored objects, the chromatic colors.

Photographic Materials

An exhaustive treatment of this subject should doubtless include the evaluation of source efficiencies in terms of photographic materials of different spectral sensitivities. In view of the present tendency in the motion picture practice, however, to use panchromatic film almost exclusively, the data presented in this paper are confined entirely to relative efficiencies as measured in terms of panchromatic film, and Eastman Panchromatic Motion Picture Negative was used throughout.

Relative Efficiency in Terms of Gray Objects

Since by definition a gray, white, or black object does not in any way change the quality (spectral composition) of the reflected light, measurements made using a series of gray objects may be regarded as giving values of actual photographic intensity or photographic candle power for the various light sources. For this purpose a test chart was prepared consisting of 12 areas, each 4-inches square, arranged as shown in **Figure 1.** Ten of



Read up beginning with square at lower left.

these were prepared by exposing sheets of photographic developing-out paper. A developer was used which gave a dep having a negligible amount of selective absorption, thus giving a series of true grays. A piece of black velvet and a block of magnesium carbonate formed the end members of this gray series. The reflecting power **(R)** and density **(D)** values for the various areas of the test chart are shown in Table 1. This test chart was hung in a vertical position on a suitable support in front of a black curtain of sufficient size to fill completely the entire field

Table 1

	Refl. %	Density	Log R
Magnesium Carbonate	98.	0.01	1.99
Photographic Paper 1	68.	0.17	1.83
2	43.	0.37	1.63
3	29.	0.54	1.46
4	19.	0.72	1.28
5	14.	0.85	1.15
6	9.5	1.02	0.98
7	7.0	1.15	0.85
8	4.2	1.38	0.62
9	3.4	1.47	0.53
10	2.3	1.64	0.36
Black Silk Velvet	0.4	2.40	$\bar{1}.60$

of the camera lens, thus reducing the effects of lens flare to a minimum. A standard Bell & Howell camera equipped with a 75 mm. f/3.5 Zeiss Tessar lens was set up so that the optical axis of the lens was perpendicular to the plane of the chart surface and passed through its center. The distance was adjusted so that when the lens was in sharp focus the image of the test chart just filled the camera aperture. The camera was driven by a directly connected synchronous motor, thus insuring a precise determination of exposure time **(t)**.

The chart was illuminated from both sides by light incident at 45° to the plane of its surface, one source being set to the right and one to the left of the camera, thus insuring freedom from specular reflection and also uniformity of illumination over the entire chart surface. Since the entire chart is relatively small (12x16 inches) it was found possible to obtain satisfactory uniformity in all cases.

The illumination incident on the test chart was measured with a carefully calibrated Macbeth illuminometer. These measurements were made on the magnesium carbonate black composing one element of the gray series. A reflecting power of 98 per cent for this surface was assumed, this being in accordance with accepted practice. The values of reflecting power for other areas of the chart were measured with the same Macbeth illuminometer set up in the same position as that occupied by the camera. In this way the values of reflecting power obtained are those actually effective in the photography of the test chart. Readings were made by three observers and results averaged.

The exposure time **(t)**, depending upon the taking speed and angular opening in the camera shutter, and the illumination **(N)**, incident on the test chart, were adjusted so that a just perceptible density was obtained on the image of a black velvet area. The exposure times used varied from 0.25 to 0.083 second. These are all sufficiently near to the average exposure time in motion picture practice, that is 0.03 second, to eliminate any possibility of the reciprocity failure introducing deviations from the results obtained in average studio practice. Development was carried out in a solution compounded according to a formula used extensively in motion picture work, and for a time resulting in a normal contrast (.=0.80 approximately).

The resulting density **(D)** values were read in the usual manner and plotted as a function of the logarithms of the reflection power (log R) of the corresponding areas on the test chart. Since all other factors are constant, the exposure incident on the film is directly proportional to the reflecting power of the test chart areas, hence the log **R** values are directly proportional to log **E** and the curve thus obtained is therefore in the form of the usual density-log exposure characteristic of the photographic material. A curve similar to that shown in **Fig 2** was obtained in this manner for each light source.

The point on the characteristic curve where its slope (**dD/d** log **E**) is equal to 0.2 was assumed to be the practical limit for the satisfactory reproduction of shadow detail. The assumption of this value may be open to some question but there is strong evidence that it is not in serious error. Moreover, the use of a slightly different

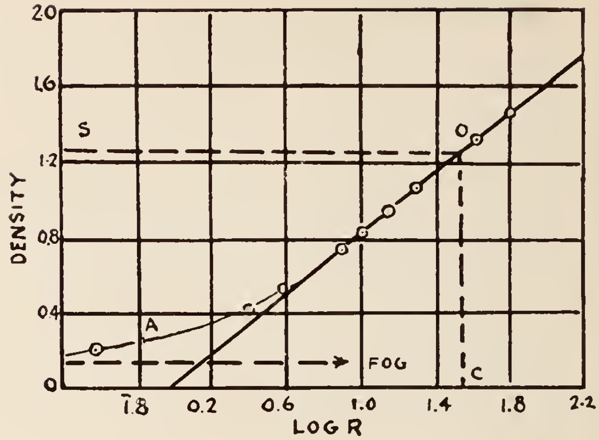


Fig. 2

value would not change the magnitude of relative efficiency, but only that of the actual exposure required in any case which is of minor importance for the purposes of this paper.

From available data[2] it is possible to determine for any lens aperture, focal length, and object distance, the relation between the object brightness (B_0) and the illumination incident on the film (N_n). This, together with the known values of exposure time **(t)** and illumination on the chart (N_0), makes it possible to compute the exposure **(E)**, in foot-candle seconds, incident on the film and corresponding to the point of limiting useful gradient. This was done for each light source and these values are shown in Table II in the column designated as E_m. It is evident that the greater the value of this exposure the less is the photographic efficiency of the light source. In the last column of Table II are values of relative photographic efficiency **(W)** computed on the assumption that the photographic efficiency of mean noon sunlight is 100 per cent. It should be kept in mind that these values of relative efficiency are based on equal intensities and not upon equal energy consumption.

(To be continued)

Table II

No.	Source	Line Amps.	Line Volts	Arc Volts	Watts	Total Lumens	Total L/W	Effective Lumens	Effective L/W	Photic Efficiency E_m	E_x	U_v
1	Sunlight	--	--	--	--	--	--	--	--	0.004	50	100%
2	White Flame	38	110	78	4070	150,000	38	45,000	12	.009	115	43
3	Pearl Flame	38	110	76	4070	220,000	54	66,000	16	.011	140	36
4	Yellow Flame	38	110	78	4070	250,000	61	75,000	18	.015	190	26
5	Orange Flame	40	110	72	4400	190,000	43	57,000	13	.014	175	29
6	Red Flame	44	110	72	4840	120,000	25	36,000	8	.008	118	46
7	High Intensity	78	110	60	8600	--	--	25,800	3	.005	60	83
8	High Intensity	150	110	80	16500	--	--	209,000	13	.005	60	83
9	Low Intensity	83	110	65	9100		--	18,200	2	.008	100	50
10	1 Hg.	5.4	110	--	510*	--	17.9	4,600	9.0	.012	150	33
11	3 Hg. + 1 Ne.	23.3	110	--	2180*	--	--	16,300	7.5	.016	210	24
12	2 Hg. + 1 Ne.	17.9	110	--	1670*	0-	--	11,800	7.0	.022	280	20
13	1 Hg. + 1 Ne.	12.5	110	--	1160*	--	--	7,130	6.1	.026	335	15
14	1 Ne.	7.1	110	--	660*	--	--	2,180	3.3	.033	425	12
15	1 Hg.	3.8	110	--	430	7,700	17.9	3,100	7.2	.012	150	33

* Power Factor 0.85

Foreign News

England

A trade paper reports that both the sound and the color processes involved in the making of some special advertising two-reel pictures have been successfully demonstrated in London. The company producing these films is the "General Film Productions" of Kingsway, recently formed, which has secured the exclusive rights for the use of this new sound and color process.

The Elstree Studios, specially built for sound pictures for Photophone are now nearly completed and comprise most up-to-date sound and lighting equipment.

The first full length British film to have a Photophone sound accompaniment is now completed. It has been made by British Lion and is entitled "The Clue of the New Pin."

The new British Instructional Studios at Welwyn, where sound pictures will also be made for Photophone, are nearly ready for occupation, and it is reported that some big and important productions are to be made in these studios.

According to the British press, industrial films are increasing in demand by the big manufacturers throughout England, and there is no question that the field for this type of films is definitely expanding.

Bulgaria

There are no studios in Bulgaria, but it is understood that the production of a large National film is being considered. The subject is to be story dealing with the period in which Bulgaria was under Turkish domination and is taken from the story "Under the Yoke," written by the noted Bulgarian writer, Ivan Wasoff.

There were no laws, decrees, etc., inimical to the interests of American Films promulgated during 1928, nor were there any in existence prior to this date.

Germany

The A. E. G. (Allgemeine Electricitats Gesellshaft) was well represented at the recent fair in Leipzig from 3rd to 13th of March. Several of the apparatuses exhibited were of the highest interest for cinematographic equipment.

Talkies Bring Silent Zones for Airplanes

The first aerial "Quiet Zone" in history came into being on April 11 when, after an agreement between the Department of Commerce, California Aircraft Operators' Association, and motion picture producers, the first captive balloon "Silence" signal was raised at the Metro-Goldwyn-Mayer studios.

The big balloon, to which was attached a streamer with red flags, serves as a signal to passing airplanes that talking pictures are being made at the studios. Under the agreement, whenever aviators see one of these balloons over a studio, they are to avoid the location by at least 2,500 feet.

The plan grew out of trouble encountered by talkie producers when planes flew over the studios. King Vidor, director of "Hallelujah," was the first to complain, when he found open-air sequences in sound almost impossible at the studio because of airplane noises. He reported the matter to the Motion Picture Producers' Association, which promptly negotiated with the aviation bodies.

Violations of the agreement will be handled by the Department of Commerce, according to G. F. Rackett of the picture association's technical bureau.

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FOR SALE—Complete small motion picture laboratory equipment consisting of 200 ft. Stineman developing system with special wash tank; Step type motor driven printer, 1000 ft. neg. cap; motor driven drying drum, 600 ft. cap.; motor driven neg. film inspector with rewind and several other small items. This equipment is in first-class condition. Price complete, $225.00. For information call or write C. W. Stumph, 701 3rd St., San Bernardino, Calif.

FOR SALE—Acme S.V.E. portable moving picture projector in perfect condition. Complete with gold glass shutter. Stereopticon attachments; extra 1000-watt lamp and cover. Dunn, 6074½ Selma; Phone, GL-3044.

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Du Par, E. B.—Warner's Vitaphone
Max Dupont—Vitacolor

Evans, Perry—
Edeson, Arthur—Fox Studio
Fabian, Max—M.-G.-M.
Fisher, Ross G.—Fox
Fildew, William—

Gilks, Alfred—Paramount
Gray, King D.—Thunder Bay Film, Ltd.
Guissart, Rene—Fox. Elstree Studio, England
Good, Frank B.—Warner Bros.
Gaudio, Gaetano—Warner Bros.

Hallenberger, Harry—Paramount
Hilburn, Percy—M.-G.-M.
Hyer, William C.—Educational
Horne, Pliny—
Haller, Ernest—First National
Jackman, Floyd—
Jackman, Fred W.—Technical Director, Warner Bros.
June, Ray—United Artists

Kershner, Glen—Caddo
Kornmann, Anthony—
Koenekamp, H. F.—Warner Bros.
Kurrle, Robt. E.—Tec-Art

Lundin, Walter—Harold Lloyd, Metropolitan
Lockwood, J. R.—

Marsh, Oliver—M.-G.-M.
Miller, Arthur—Pathe
Miller, Virgil E.—F. B. O.
Mohr, Hal—Universal
McDonnell, Claude—London, England
MacWilliams, Glen—Fox
Meehan, Geo.—Tec-Art
Morgan, Ira H. —M.-G.-M.
Musuraca, N.—F. B. O.
Milner, Victor—Paramount

Oswald, H. M.—
O'Connell, L. Wm.—Fox

Pahle, Ted—F. B. O.
Palmer, Ernest—Fox
Powers, Len—
Perry, Paul P.—United Artists
Perry, Harry—Caddo Prod. Met. Studio
Polito, Sol—First National

Roos, Len H.—c /o Steffens Studios, Vancouver, B. C.
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Schoenbaum, Chas.—
Stengler, Mack—F. B. O.
Stevens, Geo.—Hal Roach
Struss, Karl—United Artists
Stumar, John—Universal
Stumar, Chas.—Universal
Sharp, Henry—United Artists—Doug Fairbanks
Schneiderman, Geo.—Fox Movietone
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Seitz, John F.—First National
Snyder, Edward J.—Metropolitan
Steene, E. Burton—

Tannura, Philip—F. B. O.
Tuers, Billy—Caddo
Tolhurst, Louis H.—M.-G.-M.

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James Van Trees—
Van Enger, Charles J.—Fox
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Walker, Vernon L.—Warner Bros.
Wrigley, Dewey—Metropolitan
Wyckoff, Alvin—United Artists
Wells, Conrad—Fox
Wenstrom, Harold—
Whitman, Philip H.—
Wilky, L. Guy—
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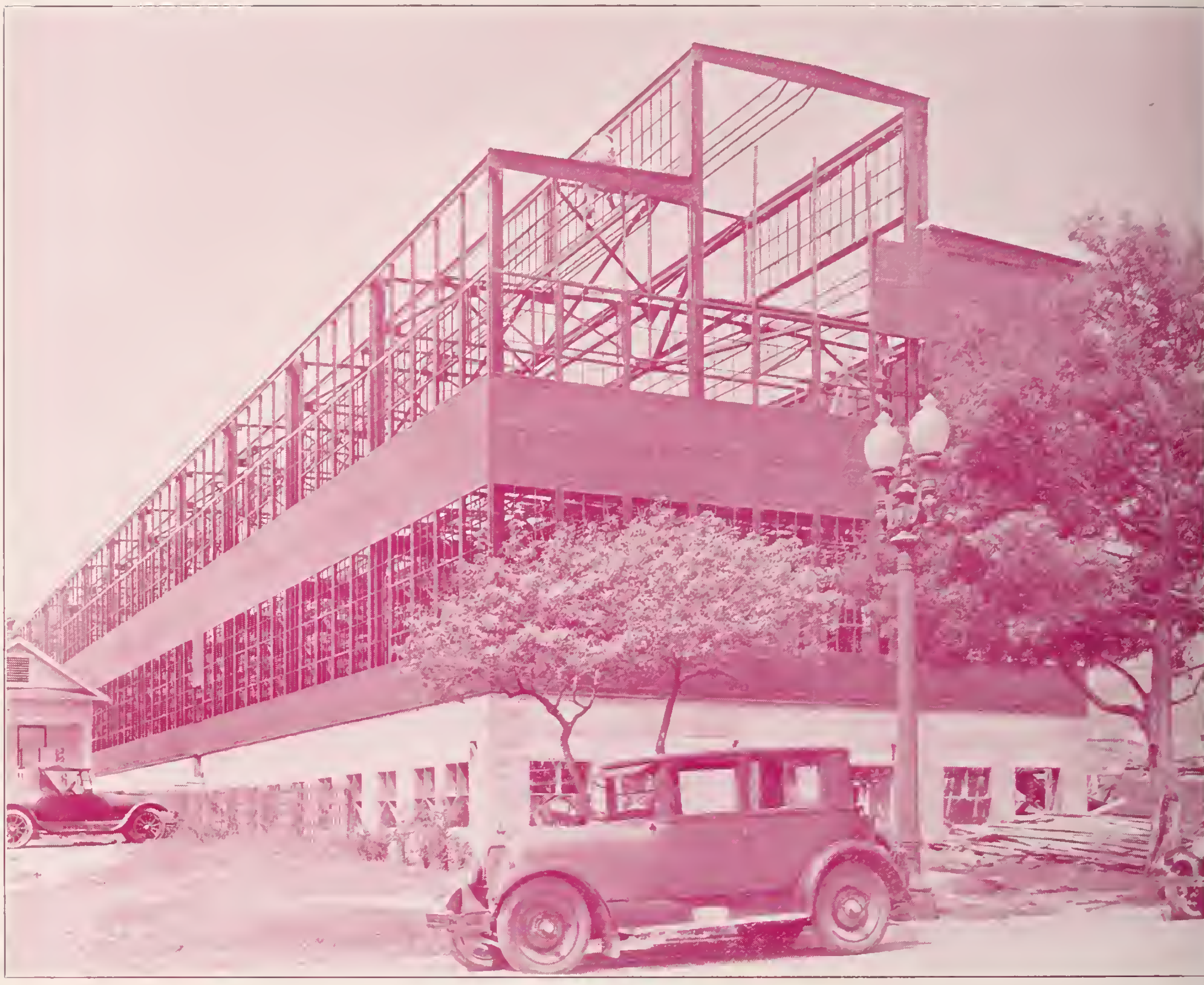
Westerberg, Fred—United Artists



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A.S.C. MAGAZINE

American Cinematographer

June 1929
Vol. X No. 3
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A technical and educational publication, espousing progress and art in motion picture photography.

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Vol. X

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No. 3

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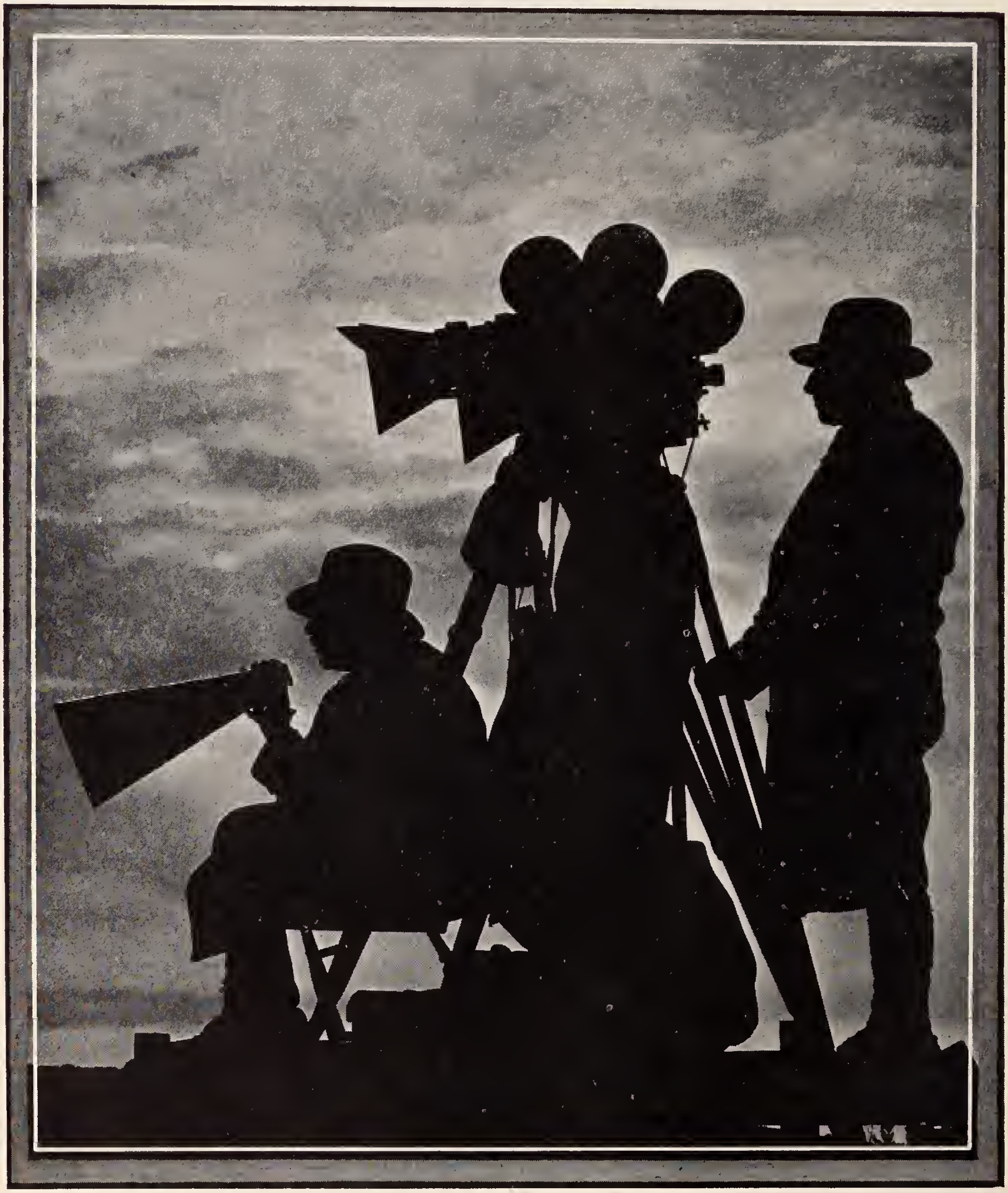
Edwin Carewe, producer-director and Robert Kurrle, A.S.C. filming dusk shot for "Evangeline" starring Dolores Del Rio



". . . . half the task was done when the sun went down, and the twilight Deepened and darkened around; and in the haste the refluent ocean Fled away from the shore and left the line on the sand beach, Covered with waifs of the tide, with kelp and slippery sea weed . . . ."

New Silent High-Speed Intermittent Mechanism for B. & H. Camera

Detailed Explanation of New Movement as Presented Before the S. M. P. E. at that Society's Spring Meeting in New York City, May 6 to 9, 1929.

By A. S. Howell and Joseph A. Dubray

In the March issue of the American Cinematographer a detailed explanation was printed of the silencing of the Bell & Howell camera for sound work. The paper by Mr. Howell and Mr. Dubray as presented at the S. M. P. E. meeting consisted of two parts. The first part dealt with the silencing of the camera. The second part explained the new high-speed intermittent movement. As the silencing has already been explained in the March issue, we are now only printing the second part of the paper dealing with the new high-speed movement. According to advice from the Bell & Howell organization, this new high-speed movement, while perfected, will not be ready for distribution before approximately another six weeks. However, as this issue goes to press no definite date on which distribution will start has been announced.

THE intermittent mechanism of a motion picture camera is, so to speak, the heart of the whole instrument, since upon it depends the precise registering of the rapidly succeeding photographic records.

The intermittence of movement has from the very beginning of motion pictures, put to task the inventive genius of motion pictures Engineers, in order to solve the problems involved in the designing of a mechanism which would, while working at a speed of 16 pictures per second, perform a cycle of four main and distinct movements.

1:—The engaging of the film-feeding fingers into the film perforation.

II:—A downward movement of the fingers to bring an unexposed portion of the film in the proper position in front of the camera aperture.

III:—A backward movement to withdraw the fingers from the film perforations.

IV:—An upward movement of the fingers to bring them in position to re-engage into the film perforation and repeat the cycle.

During this cycle of movements, the shutter of the camera was to make one complete revolution.

The mechanical problems inherent to this rather complex cycle of movements had been happily solved with a reasonable disregard of the noises resulting from the functioning of its parts, all attention being paid to the accuracy of registration and the elimination of any possibility of damaging the surface or the perforations of the film.

In due course of time, intermittent movements were developed which permitted a considerable increase in the photographing speed, that is to say, in a considerable increase of the number of frames which could be exposed each second.

A paper introducing such a mechanism capable of performing as high as 200 cycles per second was present- Spring Convention of 1923. ed to this Society at the

Again, the noises inherent to this mechanism were, to some extent, disregarded.

The advent of sound motion pictures demanded a mechanism capable of noiselessly completing at least 24 cycles per second and also capable of withsatnding a much more strenuous usage than the movements in existence, due to the fact that the average length of scenes taken for sound purposes is at least four to six times greater than the average length of scenes photographed for the silent drama.

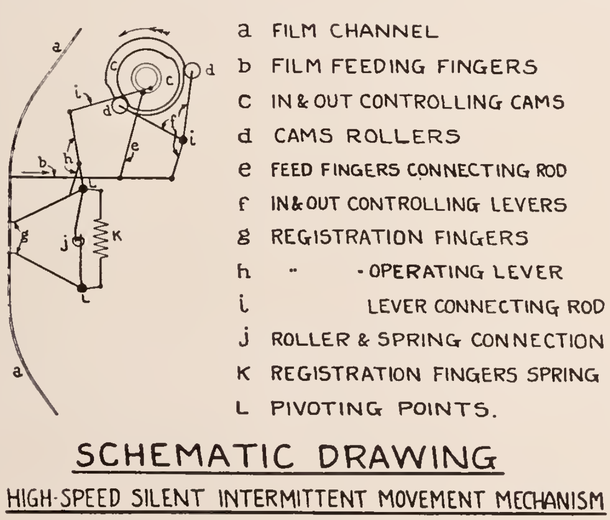


Fig. 5—Schematic drawing of the new B. & H. high speed intermittent movement mechanism.

At the same time that the feverish demand for camera equipment suitable for sound work brought about the silencing of existing mechanisms, the camera engineers did not consider this adaptation as quite sufficient for the needs of the new industry and the designing of a new mechanism was deemed highly desirable.

The main prerequisites of such mechanism are the absence of noise and the ability of performing at a minimum speed of 24 pictures per second (90 feet per minute), while conserving intact the indispensable attributes of perfect registration, forward and backward movement and an as complete as possible elimination of friction upon the surfaces of the film, in order to avoid the evils of scratches and abrasions.

The mechanism being described in this paper is the latest contribution of the Bell & Howell Company to the Motion Pictures Industry.

In order to simplify its description, we shall consider one after another its principal parts, namely:

The Film Channel.

The Film-feeding Fingers.

The Registration Fingers.

and conclude with a brief description of features of general interest, such as the lubricating system and the general assembly of the mechanism.

THE FILM CHANNEL:—The film channel can be divided into three main sections, an upper and a lower curved section, each having a radius of 1¼ inch and a central plane section.

Figure 5 shows a schematic drawing of the mechanism, plainly illustrating the above mentioned essentials, Film Channel, Film-feeding Fingers and Registration Fingers.

The Film-feeding Fingers operate in the upper curved section, while the plane section comprises the camera aperture and the location of the Registration Fingers.

The central plane section of the Film Channel has been kept within the shortest possible length in order to insure perfect flatness of the film surface at the time of exposure.

The longitudinal curves impressed upon the film by the curved sections of the channel, in conjunction with the transverse guide and ten-

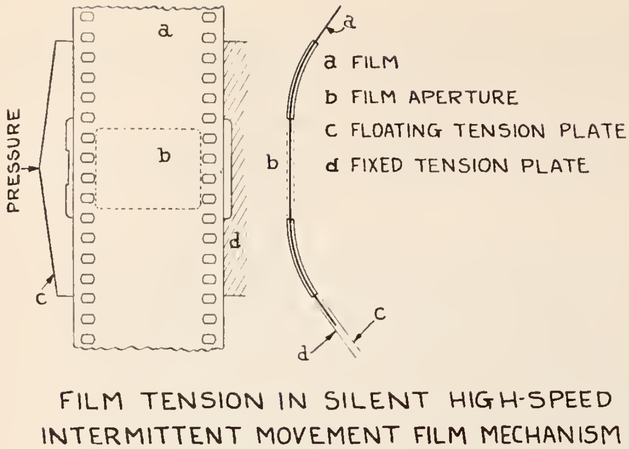


Fig. 6—Film tension in the new B. & H. speed intermittent movement mechanism.

sion plates, precent any possibility of the film sagging or curling, even under very severe temperature conditions.

The film is thus kept under control througout its path in the channel, and the presentation of a perfectly flat film surface at the focal plane of the photographic lens is thus assured.

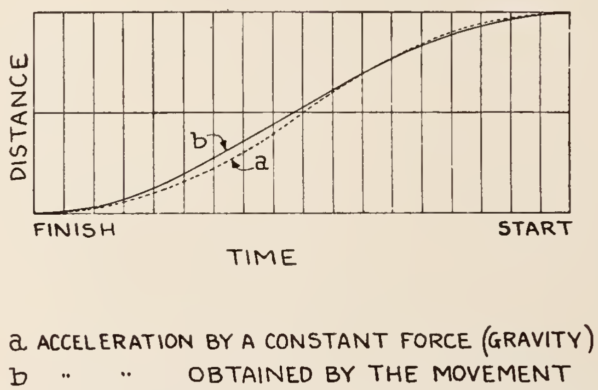


Fig. 7—Comparative curves of the acceleration by a constant force with the acceleration obtained through the movement.

The Film Channel consists of two members. The film is inserted in the space thus provided for and which is so designed as to provide a frictionless surface passage of the film through it.

A light spring pressure of the pareture plate against the body of the movement prevents possible injury to the film or to the mechanism, should be threaded improperly.

The aperture plate is provided with a lock and the film cannot be introduced into the channel if the lock is not in its engaged position. This arrangement eliminates all possibilities of neglecting to lock the aperture when the mechanism is replaced in the camera after having been withdrawn from it for the purpose of cleaning, even if this operation is performed under the greatest possible pressure of urgency.

A very light tension at one side of the film keeps it registered sidewise against a solid rail.

Figure 6 shows the arrangement of such tension, which is exerted only on the portions of the film which assume the curved shape of the film channel.

The point on the floating tension plate at which the pressure is applied was determined by careful calculation, and is so located as to assure an equally distributed pressure along the entire side tension-producing surfaces.

THE FILM-FEEDING FINGERS:—The function of the Film-feeding Fingers is to engage in the perforations, carry the film downward or upward, according if it is desired to record the motion of the subject normally or reversed, to withdraw from the performations and resume its original position as at the beginning of the stroke.

The ideal IN and OUT movement of the Film-feeding Fingers would be the one in which the motion occurs at a time when there is no contact between the fingers and the faces of the perforations, since the inevitable wear which occurs at the end of the fingers, is caused by the rubbing of the surfaces which contact with the faces of the perforation.

In the new mechanism here presented, the entire feed forward movement of the fingers has been held to only .012 inch and only 1/6 of this total displacement, or .002 inch, is the extremely short motion which takes place from the time at which the fingers begin to engage in the perforations until the entire IN movement is completed.

In Figure 7 curve "A" represents the acceleration due to a constant force, that is to say, GRAVITY. Curve "B" is plotted from the downward movement of the film.

It will be noticed that during a complete from top to bottom stroke, the acceleration and deceleration of the feeding fingers lie very close to the ideal. The variation is very slightly greater in the deceleration.

It is because the ideal acceleration condition is so closely met that the time necessary for the IN and OUT movement of the feeding fingers has been reduced to the smallest extent.

The amount of noise produced in intermittent movements by the rapping of the Film-feeding Fingers against a stationary film, is determined by the amount of "play" between finger and perforation.

In the movement here presented, the Film-feeding Fingers are .008 inch narrower than the film perforation, which condition limits the overthrow to .004 inch, that is to say, the Film-feeding Fingers move along a path only .004 inch long before touching the faces of the perforation.

The extent of displacement is so small that the downward movement of the fingers is extremely slow at this moment, so that they may practically be considered as stationary at the instant in which they actually come ly come into contact with the film perforation.

To insure a still greater resistance to wear, the ends of the Film-feeding Fingers are chrominum plated.

In Figure 8 are shown five schematic drawings of the mechanism, at five different phases of movement.

It is well to remark that the schematic condition of the drawings does not permit to illustrate the extremely small overthrow previously referred to.

In position 1, the Film-Feeding Fingers are withdrawn from the perforations and the Registration Fingers are holding the film stationary by spring pressure.

In position 2, the Film-feeding Fingers are shown during their upward motion. The film is still held in position by the Registration Fingers and remains so while

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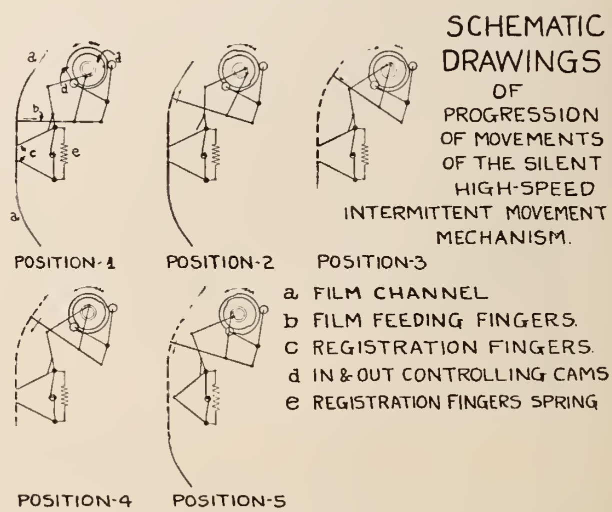

Fig. 8—Schematic drawings illustrating different phases of the cycle of movements performed by the new B. & H. high speed intermittent movement mechanism.

Lighting the Big Shots in Chicago

The Opening of the World's Largest Sports Arena Presents Some Unusual Lighting Problems

By R. J. Duggan
Managing Director, Ambassador Film Company

[When the ordinary motion picture house patron sits back and watches a few feet of some big news event flash on the screen he little realizes the difficulties that often have been faced to provide the picture. The following article tells of the problems in lighting Harmon's Stadium in Chicago for the opening.—Editor's Note.]

IF "PADDY" HARMON had built his stadium in Hollywood or New York City instead of in the middle of the United States the demand of the newsreel men for the amount of light necessary would have been an easy request to meet. A dozen or more Sun Light Arcs is every day conversation for the men of the East or West Coast production centers where this amount of equipment is readily obtainable. In Chicago, however, a dozen Sun Light Arcs would lay in the warehouse for that many years unless some producer decides to make an outdoor gangwar picture with accurate local color.

As the making of big interior shots in the Chicago territory is the exception rather than the rule, it would be an investment of questionable soundness for anyone to tie up a lot of money in lighting equipment which would require the entire time and attention of one man to keep the rats from building nests in the rheostats. But in spite of the old law of supply and demand, sufficient capital has been interested in the future outlook of the Middle West lighting system, to enable firm, steady strides to be made toward perfection in this direction. In its entirety, the larger and more powerful equipment of Chicago is used but once or twice a year, and due to these long periods of idleness complete reconditioning is often necessary. In fact, rebuilding and remodeling the lamps to adapt them to the requirements of just one job is not an unusual thing. Another perplexing problem is the lack of proper current supply. Alternating current, in most cases, is the only thing available and generators are an expensive proposition when they are run only a few times a year.

A great deal of the lighting in the Chicago area is for Newsreel photography exclusively, and provision for proper placement of the lamps is seldom made. Conditions often require that scaffolding be built for a single shot. This means nothing in the life of the studio electrician, but it never fails to elect a yell of protest from the small producer or newsreel men who are paying for the lighting. On the rare occasions when elevations are provided, it is about as simple a job as building the pyramids. The winches, hoists, and block and tackle of the studio are supplanted entirely by plain and fancy elbow grease.

On this particular job, the new Chicago Stadium, nearly every possible problem known to lighting was presented. This Stadium is an enormous building about 350 feet long by 250 feet wide with a 150 foot ceiling. The arena seats 26,000 people and the seats, which are painted red, extend nearly to the roof. The ring for the Loughran-Walker fight was well illuminated with 54 1000-Watt lamps hanging from above the ring. Lighting the Stadium itself for crowd shots was a different proposition.

The equipment used was as follows:

Four 24-inch Mirror Searchlights, two 23-inch Search-

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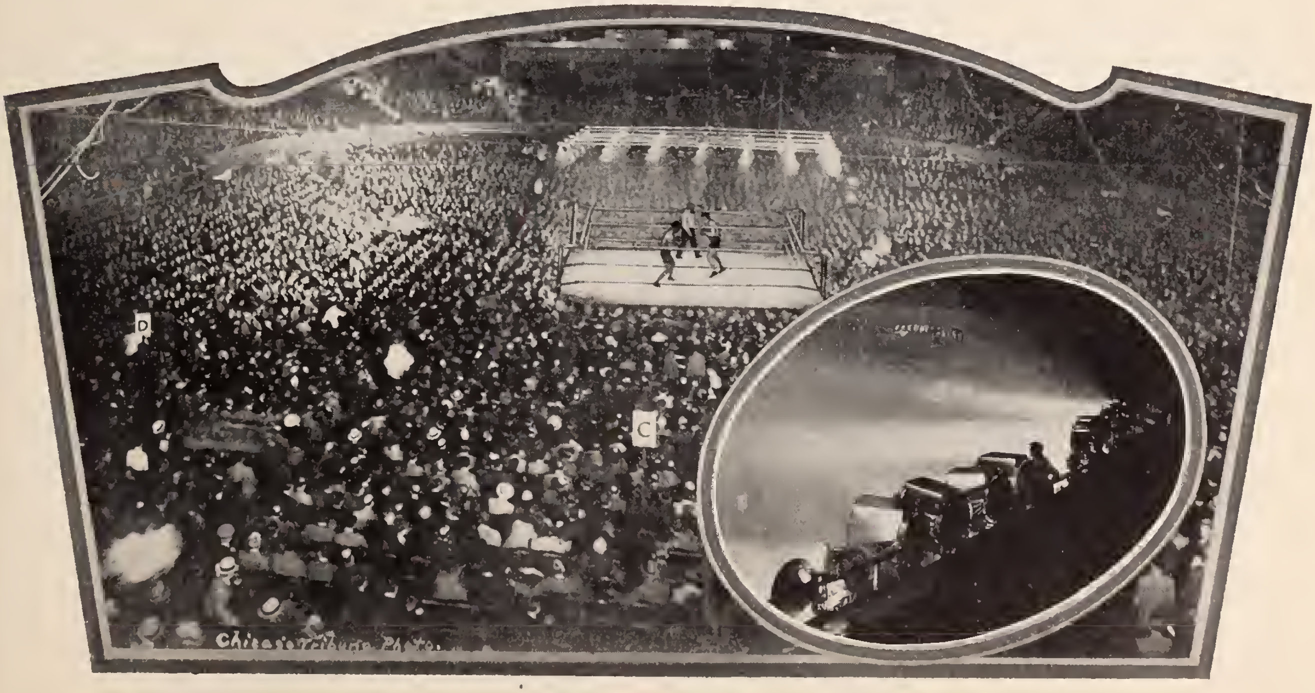


Harmon's Stadium, Chicago, all "Lit up," for its first big fight. Inset shows battery of lights used by Ambassador F.lm Company

A. S. C. Plans Announced

Class Lines Wiped Out—Membership Limited—Fellowships Planned, and Banner Year Predicted by President Seitz

NEVER in the history of the American Society of Cinematographers has the outlook been so bright as at the present.

This is the opinion of John F. Seitz, who recently succeeded John W. Boyle as President of the Society, and who is planning the greatest year the organization has ever known. Mr. Seitz, one of the profession's finest cinematographers, is short on words and long on deeds, so when he speaks one cannot afford to turn away. And his plans for the Society for the coming year indicate activity that will make it a still more commanding force in the cinematographic world.

His first move on taking office was to wipe out the lines of class distinction within the organization. For some time the membership has been separated into classes listed as First Cinematographers, Second Cinematographers, Special Process and Trick Cinematographers, Akeley, News, and still photographers. But these lines of distinction have now been eliminated and henceforth all members are classed simply as "members," with equal rights and responsibilities.

Mr. Seitz's second move was to limit the membership. This was done at the meeting on May the twenty-seventh, and the limit was set at 150 active, resident members, no limit being set for non-resident members.

JOHN F. SEITZ

And now Mr. Seitz gives us some more of his plans for the coming year:

"The American Society of Cinematographers is a social and educational body," declares Mr. Seitz, "devoted entirely to the study, practice and advancement of the art and science of cinematography. It is our object to direct all of our efforts to increasing the prestige of the cinematographer in the motion picture industry on the part of this Society.

"While friendly to all other organizations within the motion picture industry, we are not affiliated with any other body, and to properly function as a unique Society devoted to cinematography, we must and will retain this independence.

"During the present year open meetings will not be held at regular intervals, but only at such times as we can arrange for special programs that will be of general interest and of real benefit to all the members. At these meetings papers will be read relating to the business and technique of cinematography. Most of these will be prepared by our members themselves.

"Another great step which is planned is the publishing of a yearbook by the Society. This book is to contain a wealth of cinematographic data for the cinematographer, professional and amateur, the director, producer, exhibitor, engineer and all others engaged in or interested in motion pictures. This book will probably be published next March. But there will be more about that later."

At this point Mr. Seitz announces another plan that should prove to be one of the most forward steps the organization has ever taken.

"We propose during this year" says Mr. Seitz, "to inaugurate a system of conferring Fellowships in this Society upon those members making the greatest or most significant contributions to the art or science of cinematography. This degree, which can only be earned by hard and inspired work, in addition to being a mark of real distinction, will carry with it some suitable award from the Society. Details of this plan will be announced later.

"On the whole, the prospects for this Society never before have been so bright as at present. Never before has the way been so clear for the A. S. C. to step out ahead of this fast changing and progressive business and light the way for all others to follow as we prove ourselves a real force for good for the cinematographer and the entire motion picture industry."

The S. M. P. E. Convention as Seen by Our Technical Editor

Joseph Dubray Gives An Intimate and Chatty Account of the Convention Held in New York from May 6th to 9th.

[Our Technical Editor decided that a letter would be the best report of the Convention. After reading it we decided he was correct.—The Editor.]

Dear Hal,

Chicago, Ill., May 13, 1929.

Just back in Chicago from the "Big Village," and I can't resist the temptation of pounding on my typewriter for your benefit and the benefit of the A.S.C. a little story on the S.M.P.E. Spring Convention.

After a very pleasant journey through the Spring beauty of the Pennsylvania hills, I reached the Metropolis and the hotel safely, in spite of the numerous dodgings of my cab through the afternoon traffic of Broadway and Seventh Avenue.

A very pleasant surprise awaited me there, and that was the discovery that George Schneidermann was stopping at the Park Central, which was to be the scene of the Convention. With him was Tappenback and some of the Fox experts, who were busy arranging things for their departure for Europe in the next few days. Another surprise, and a pleasant one, was when I bumped suddenly and unexpectedly into Joe August, who was there waiting for another Fox Company, which finally showed up a few days later.

Going through the register of the Hotel, I discovered, with delight, that Mr. Richardson, of Mole-Richardson, and Mr. Rackett, of the Producers' Association, were going to represent Hollywood at the Convention.

Germany was to be there in the person of Dr. Petersen, of Agfa, and England was represented by Mr. Rowson, the Chairman of the London section of the S.M.P.E.

And so, at 10:00 A. M., on Monday, May 6th, with Engineering exactitude, the Convention was opened by President L. C. Porter.

If you want to know exactly what was done during the four days that the Convention lasted I cannot offer a better suggestion than for you to attentively peruse the Program, which has been followed quite faithfully. The forenoon of Monday was dedicated to reports of the different committees, and I know that you can visualize J. I. Crabtree reading the achievements of the Motion Picture Industry during the last semester, and Major Edw. J. Bowes saying a few words to us with his marvelous radio voice.

In the afternoon your servant bored the Assembly by reading something about the Bell & Howell motion picture camera in sound pictures and the new silent high-speed movement. Oscar DePue of Chicago presented an interesting printing machine; F. D. Woodward talked about patent matters, and finally the stentorian voice of F. H. Richardson definitely settled the question of better projection.

In the evening, after a very congenial dinner, we attended the showing of "Alibi" on the Park Central Hotel Roof. They were practically all there—L. A. Jones, of Eastman; our friend, Herford Cowling; Dr. Sease, Dr. Mees, Mr. Rayton, of Bausch & Lomb; Richardson and Rackett, of Hollywood; Coffman, of New York; Dr. MacKenzie, Mr. Elger, of General Electric; Cameron, the Publisher, writer and engineer; Benford, of Schenectady, and many, many others whom I should mention, but space and memory fail.

On Tuesday morning we were conveyed by busses, autos, taxis, etc., etc., to the Bell Telephone Laboratories. L. A. Jones entertained us with an extremely interesting paper on Tinted Film for sound positive, which sounded more like an entertaining, psychological study on the reaction created in the human mind by color than a scientific paper presented to a conclave of engineers. Messrs. Blattner, L. A. Elmer and H. Pfauneustiehl, all of the Bell Telephone Laboratories, put our brains to severe gymnastics by presenting a long series of diagrams, curves, photographs and mathematical expressions—enough to make you feel like getting by yourself in some secluded spot and absorb, absorb and absorb. K. F. Morgan, of Hollywood, followed with a truly inspiring description of the marvelous achievements attained in re-recording. His paper was entitled "Technical Problems Encountered in Re-recording," but his demonstration proved that these problems were solved with extremely gratifying results.

Mr. J. B. Irwin closed the Session and off to lunch.

In the afternoon Hollywood came to the fore, and Mr. Rackett read the Carroll Dunning paper, which was cause of many amusing comments and a sincere expression of admiration for the marvelous work the Dunnings have conducted in the past few years. Our friend, Richardson, talked about and presented on the screen the Universal Camera crane—a great boost to the Universal Studio engineers and to Hal Mohr.

The "Clou" of the afternoon was a television demonstration. Dr. H. E. Ives walked to the Speaker's Platform amid thundering applause. The demonstration given by him was as fascinating as it was instructive. After a brief description of the system, illustrated by lantern slides showing the apparatuses, the actual demonstration took place; the sending apparatuses being at one end of the large hall and the receiving apparatuses at the other extreme end. No matter how accustomed one is to witnessing scientific miracles, one cannot but feel his heart beating a little faster when he actually sees on the red, glowing screen the picture of the person who is talking at the other end of the wire. And, believe me, Hal, my heart beat just as fast when a young man was talking to us as when the lovely features of a lady assistant to Dr. Ives flashed her pretty smile on the screen and charmed our ear with her voice.

Since no program was scheduled for the evening, I just ran over to 42nd Street, the headquarters of the New York Cinematographers International. It was a meeting night and I was received extremely cordially by the 150-odd members present. I spent a very interesting evening with them, and "so to bed."

Wednesday morning found me on my way to the R.C.A. Photophone projection room. Mr. John Klenke, of the Visual Instruction Section of General Electric, gave a very interesting screen demonstration in which notes struck on the piano would show the photographic record of their sound on the screen at the same time as the note was played. I am ashamed to confess that I do not recall offhand the name of the master at the piano, but I indeed enjoyed the whole demonstration, both technically and artistically.

John B. Taylor, also General Electric, gave us a very remarkable talk and demonstration on "The Needle of the Optical Phonograph." I think that this title is extremely fitting to the description of the optical system of G. E. recording apparatuses. Mr. Taylor demonstrated

Continued on Page 21

Some Problems Related to Composite Photography

A Paper Presented at the New York Meeting of the S. M. P. E., May 7, 1929

By Carroll Dunning

Dunning Process Company, Hollywood, California

So much is written about the screen stars and their exploits that the picture fans rarely hear about the men who are responsible for many of the most thrilling, artistic, and sensational scenes in pictures. These men are the highly trained cinematographers who in miniature and special process photography make possible the picturization of scenes that could never be made in any other way. They are unsung heroes of the film world, and this article will give some idea of what service they perform.—Editor's Note.

ONE of the early motion picture spectacles was created by buying two old locomotives and having them crash together in a head-on collision. The engineers had pulled open the throttles and jumped prior to the impact. A couple of empty engines butting each other will not suffice today. The human element must be included in the shot. You must appear to maim at least one engineer and strew the track with the injured or the option on your employment contract will not be renewed.

The present scenario specifies thrills too dangerous for even stunt men to attempt, and the exhibitor insists upon "big situations," too costly for the most extravagant producer to pay for.

The trick photographer was born and filled the niche for a time with split mats, double printing, etc. But a wise public soon became critical and demanded realism. This necessity has created in Hollywood a small group of men who are outstanding in their versatility and resourcefulness. Some are under contract with the large studios, others are free lancing. Problems are presented to them at a moment's notice, which require an adequate understanding of mechanical, electrical and illuminating engineering, a proper appreciation of art and a due regard for dramatic values. The misnomer, "trick men," still sticks but they are the really "special effect" technicians of the industry.

Of the hundreds of nuts they are called upon to crack, I will present a few.

Scene No. 342 in a recent aviation picture called for a semi-close-up of a prominent actress flying above the ocean wastes (there must be no vessels or land in sight). She could not fly and refused to go as a passenger. The shot across the plane was too close to use a double. A studio technician, who is also an aviator, filmed the ocean minus the plane from a five-hundred-foot elevation and incidentally went about ten miles off shore in a land plane because he knew he would get a better cross lighting effect. From his ocean negative a balanced transparency was made, and through the latter the actress and aeroplane was "doubled in" at the studio. Of course all of the movement of the original aeroplane in its ever-changing relation to the ocean beneath was imparted to the "doubled in" shot, even though the actress emoted in a perfectly stationary plane sitting on the stage floor.

Scene 128 in another picture called for a love scene on the stern of a pleasure yacht in mid-ocean, with dialogue between star and hero, and a love song by said hero. The silent version had been shot some weeks previously on a chartered boat rented at $400 a day, and the owner had sensibly refused an attempt to load a five-ton sound recording truck on his private yacht. So, 300 feet of ocean was photographed from the Catalina excursion steamer and doubled in with a balanced transparency as described in the preceding example. The yacht stern consisted of eight square feet of floor boarding, a railing, wicker seat and a flag pole. The sound of the side-wash of the water was picked up by hanging a microphone over a water-filled box through which a workman swished a wooden paddle. A second "mike" picked up the dialogue and song while a third recorded the orchestral accompaniment of an Hawaiian orchestra, supposedly amidship of our nailed-to-the-floor yacht. The composite photography was completed instantaneously and simultaneously with the recording of dialogue, song, music and sound effects. The result on the screen was startlingly realistic.

Scene 321 specified the explosion of a gasoline tank under the cowl of an auto, enveloping the agonized driver in flames. In the first tests it was found that gasoline burned so violently that it left no unexposed silver in the negative on which to photograph the double-exposed driver. Finally, by blowing an ignited alcohol vapor across a container filled with a mixture of potassium chlorate and powdered sulphur, the flame retained its transparent character to its full height, because the liberated oxygen and the potassium kept the flame tongues more or less a thin blue to their extremities.

Scene 19 required a miniature dam to be blown up by the villain and the released water to rush almost into the lens of the camera. A week was spent in constructing the dam and when the dynamite cap burst the walls, a gob of mud plastered itself on the camera lens. The resultant negative looked like a microphoto of a magnified polyp. The dam had to be rebuilt and reshot.

A short time ago, a producer considered the advisability of sending a picture company to Italy. The dramatic portions of the story were night scenes along the Venetian waterways. To give the feature what is known as "big production value," it was necessary to open with an establishing shot showing the principals in an actual gondola passing through the Grand Canal. The electrical department immediately tabooed such a plan for they knew there were not enough lights in all Europe to illuminate Venice from the Rialto Bridge to the Lido ferry. The technical supervisor solved the problem by building an exact replica in miniature on a scale of one inch to the foot.

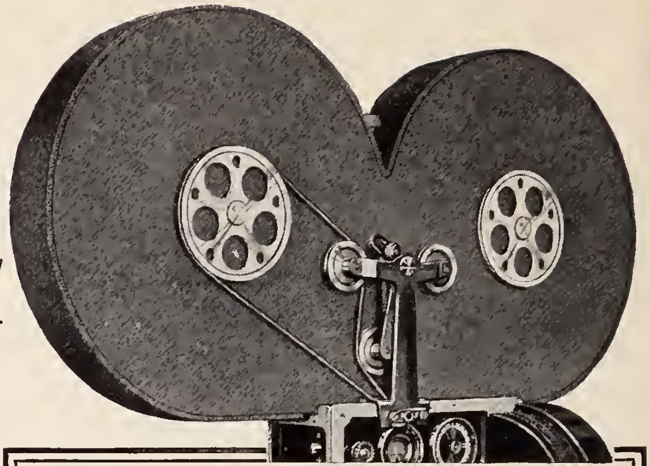
Even the smallest detail was carried out down to the little wired and lighted electroliers in the Plaza of Santa Maria. The church itself was a work of art. When finished, the floor of the stage was flooded with water to a depth of eight inches covering about an acre in area, and Venice stood complete and realistic. A motor-driven camera, with lens six inches from the water's surface, was mounted on a board and floated through the canals, photographing the panoramic scene as it moved along. Into this scene was doubled a semi-closeup of the two principals seated in a full size gondola. The realism of the resultant composite photograph, which also showed the rowing gondolier on the stern, would never be questioned by any audience.

Relativity is an important factor in all miniature work. If the scale representing an English countryside traversed by a railroad is built one inch to the foot, it is a simple matter to construct the railroad station and the farm houses of the correct size, but regular straw is too large to represent roof thatching. Perhaps the strands

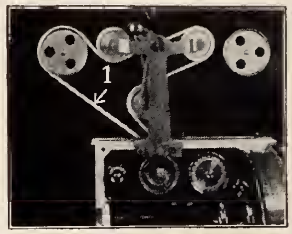
Continued on Page 20

BELL & HOWELL

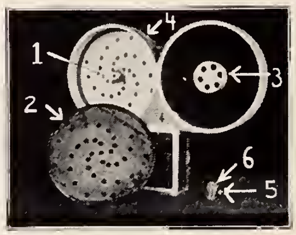
precision and accuracy
have silenced
the camera mechanism!



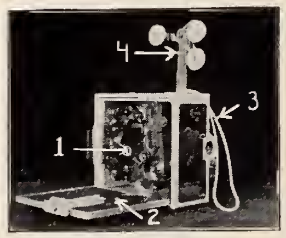
Above: B. & H. 100-ft. Sound-Proof Magazine equipped with Silent Belt Tightener, that keeps uniform tension at all times, and endless fabric belt.



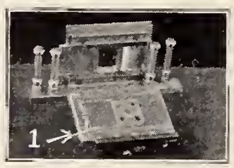
Right: Silent Belt Tightener on B. & H. 400-ft. Magazine. 1. Endless fabric belt.

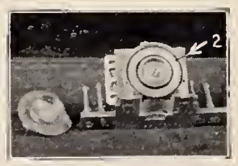


Left: 1000-ft. Sound-Proof Magazine taken down—1. Holes drilled in back of Magazine drums—2. Front on Magazine with rubber cover removed—3. 3-inch spool—4. Rubber outer-cover—5. Film Roller—6. Oilless bearing of film roller.



Right: Speed movement of B. & H. Camera equipped for sound work—1. Check pawl Super-Speed movement—2. Felt lining of camera door—3. Endless fabric belt—4. Belt tightener.





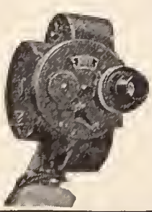
Above: B. & H. check pawl Super-Speed movement—1. Driving finger—2. Formica (fiber) gear.

BELL & HOWELL engineering has produced cameras for sound work with all mechanical noises eliminated. Fiber gears—solid bronze bearings—sound-absorbing felt linings—the removal of all lost motion—these are the factors in this important development.

Sound-Proof Magazines with endless fabric belts and silent belt tighteners also contribute to the perfection of operation that permits such equipment to be placed within eight or ten feet of the microphone *without requiring a camera booth!*

Holes drilled in the back and cover of the magazine drums to interrupt sound waves, and the outside covering of sponge rubber indicate the thoroughness of the engineering that has made such a development possible.

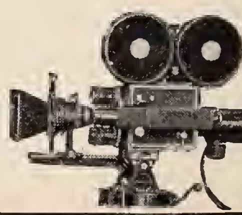
Consultations are invited on Sound Recording Installations.



BELL & HOWELL CO.

Dept. F, 1805 Larchmont Ave., Chicago, Illinois

New York, 11 West 42nd Street · · · Hollywood, 6324 Santa Monica Blvd.
London (B. & H. Co., Ltd.), 320 Regent Street · · · · · *Established 1907*



New Silent High-Speed Intermittent Mechanism for B. & H. Camera

Continued from Page 4

the shutter (not shown in the drawing) is functioning in the exposure condition.

In position 3, the Film-feeding Fingers have reached the end of their upward stroke and are advancing into the perforations. The Registration Fingers are still engaged.

In position 4, the Film-feeding Fingers have moved forward slightly and the Registration Fingers are withdrawing. This phase of the movement is difficult to illustrate in proper proportions since it involves the simultaneous motion of feeding and Registration Fingers, which covers distances but a few thousandths of an inch long.

In position 5, the Film-feeding Fingers are carrying the film downward and the Registration Fingers are in their retracted position.

The IN and OUT movement of the fingers is accomplished by means of two adjoining cams which are integral parts of the crank shaft. These cams provide positive forward and backward movement to the fingers and eliminate the use of springs.

No damage can possibly result from undue friction or strain upon the film perforations.

The motion producing surface of each cam subtend an angle of 12 degrees which is but 1/30 of its periphery. There is no load upon the inactive parts of the cams.

The cam's rollers are freely fitted in their sockets, they creep around very slowly while in contact with the active zone of the cam, and each point of their surface incurs an equal amount of wear. They can easily be removed and replaced in their sockets without the use of tools should the inevitable wear produce any loose motion.

The lubrication of the cams and rollers is assured by oil saturated felts which are in constant contact with the periphery of the cams.

The exposure condition is met by this new mechanism as in the usual 170 degree shutter cameras.

THE REGISTRATION FINGERS:—In order to insure the perfect registration of each photographic image on the film and to insure that there will be no motion in the film during the time of exposure, two pairs of Registration Fingers have been provided in this mechanism.

These fingers engage the perforations at the end of the film-feeding stroke, become stationary when fully engaged and remain so until the beginning of the following stroke.

The manner in which these fingers seize the film is entirely new.

At the moment at which they have fully completed their forward movement they become wedged against the faces of the film perforations by spring pressure. The film itself serves as a stop for the fingers, and the spring pressure locks both fingers and film, assuring absolute rigidty and perfect registration.

The Registration Fingers are also chromium plated in order to insure their longest possible life.

PIVOTS AND BEARINGS:—There are only three points in the mechanism where bearings are used.

The pivot bearings are adjustable and very generously calculated so that the perfect functioning of the movement is assured throughout its life.

LUBRICATION:—The cams and rollers are lubricated, as previously explained, by felt wicks, and the same system is used for the constant lubrication of the other rapidly moving surfaces. Oil holes are provided for the proper lubrication of the other parts of the mechanism.

GENERALITIES:—The movement proper is built around a single piece of hardened steel.

All holes which are to receive pivots and bearings are bored after hardening, with tolerances of .0001 inch.

The movement is entirely enclosed in an aluminum cap, which serves the threefold purpose of rendering the mechanism light-proof, of preventing the spattering of the lubricating material within the camera and on the film when the movement is working at full speed, and as a protection against dirt from outside sources.

Provisions have been made for the mounting of a total reflection prism in the aluminum cap of the mechanism, so that a direct focusing magnifying optical system can be mounted on the camera.

The installation of this new mechanism in the Bell & Howell camera is extremely simple and requires, as the old movement, only to be slipped in the proper position and fastened there by two clamps.

No alterations of the camera are necessary, except for the main cam, in which a worm has to be mounted to drive the mechanism itself and for a hole to be bored in the inner frame of the camera in order to provide space for a gear which is driven by the worm.

The whole mechanism which, as it has been seen, is built upon very simple lines, is remarkably small in size and presents at the same time all the necessary requisites of remarkable sturdiness and endurance.

An extremely careful adjustment of all its parts insures a most perfect functioning as well as a total absence of the noises which are so detrimental to the making of sound and talking pictures.

Projectionist Makes Good as Manufacturer

It was away back in 1919 that a motion picture projectionist, working in a Los Angeles theatre, conceived the notion that a speed indicator would be a fine thing to use in working out the musical score for a picture.

The more he thought about it the more convinced he became that he would be able to put his thought into practical operation; so he invented such a contrivance and F. A. Miller backed him up in his idea by taking the first one and Elinor, whose orchestrations for big pictures have made him famous, used it at the California theatre in writing his musical score for a picture. And that was the start for this young man.

He is M. M. Moon, head of the Moon Film Speed Indicator Company, 222 S. Hamel Drive, Beverly Hills, California.

Working out that first machine gave Moon many a headache, but was finally settled by means of a dream and a breadboard. It seems that a special adjuster gave him a lot of trouble. At times he despaired of ever getting it right. Then he had his dream one night, or rather in the wee small hours of the morning. He jumped out of bed, ran to the kitchen and getting paper and the bread board, dashed back to bed where he drew his plans which worked out to complete satisfaction.

Since then Moon has conceived and put on the market many other devices. They include a silent auto-rewind machine and a film mending machine that does away with many lost motions, various types of speed indicator measuring machines, a measuring machine for film for cutting room use; wall type speed indicators for projection room use, a speed indicator for use on cameras while filming, and other devices.

Throughout all his work he has carried the thought of making his devices to withstand any and all conditions. For example, the speed indicator for camera work has gone to all parts of the world under all conditions. Clyde De Vinna, M-G-M cameraman, took one on two trips to the South Seas, and at present is far in the interior of the African jungle with one on his Bell and Howell camera.

His devices are used by such concerns as First National, M-G-M, Paramount, Hal Roach, Harold Lloyd, Charles Chaplin, Pickford-Fairbanks, Mack Sennett, R. K. O., Warner Brothers, DeMille, Fox, Educational and Christie, to say nothing of many of the largest theatres and theatre chains in the country. Abroad they are being used universally.

"No one can guess the speed accurately," says Moon, "so why try to guess when you can have a little machine do the work for you without a mistake?"

Limitations of the Iron Ear

A Few Pertinent Suggestions On How To Get Better Results with Present Sound Equipment in Use in the Motion Picture Studios.

By Carl Rhodehamel

[The writer of this article was formerly with the General Electric Company and has had years of experience in the use of the modern condenser microphone. He has recently perfected a unique system of sound recording with a quick playback feature, for his own use in the training of voices for microphones. His views here expressed are presented solely as his own opinions. Editor's Note.]

NO MAN is better qualified than the cinematographer to understand the natural limitations of a piece of equipment.

One of the important parts of his mechanism has three good legs—but nevertheless it is unreasonable for him to expect it to walk from place to place. Neither does he depend upon his camera to say "Come closer; I cannot see you clearly."

Carl Rhodehamel

Now that the iron ear has appeared on the lot as a collaborator with the glass eye, it is apropos to point out again that the "mike," too, has its limitations.

Even though the condenser microphone is the listening outpost of the whole sound system, it cannot be expected to hold up a mechanical hand every now and then and exclaim, "Not so loud, brother, I'm not deaf!"

Briefly, then, what are the limitations of the iron ear? What can the user of sound equipment expect from the microphone, the amplifier, recording machine, and reproducer?

Those who have made a careful survey of present sound equipment from the standpoint of how to use it more efficiently, are agreed that five basic limitations should be considered.

1. Sounds must not be too loud nor too soft.
2. Sounds must be produced within the limited critical area of the iron ear—the microphone.
3. Sounds must not be too low nor too high in pitch.
4. Allowance must be made for the fact that **all** sounds within the critical area will be picked up by a microphone.
5. The microphone is an extremely sensitive instrument, and should never be touched except by the technical operator familiar with its particular characteristics.

Just what is meant when we say, "Sound must not be too loud nor too soft." Cinematographers will appreciate the difference between "too little" or "too much" light. The conditions are somewhat analogous. When sound is too soft the fixed inherent noises in the equipment will claim undue attention to the listener. When sound is too loud it will overload the equipment and result in "blasting," "cutting through," etc., depending on the type of recording machine. The range, therefore, between "soft" and "loud" is very narrow, less by far than the normal human ear.

This limitation of sound equipment is particularly apparent in recording music. When an orchestra plays normally, the conductor using wide extremes of volume, pianissimo and fortissimo, to get effects, it is necessary for the technical operator of the sound equipment to turn a dial and "bring up" the pianissimo and "cut down" the fortissimo, in order to bring the music within the scope of the apparatus. Of course, this spoils the music from the conductor's point of view, but saves it from the technical operator's point of view.

Therefore, wouldn't it have been more reasonable for the musician to have kept his volumes within the capabilities of the equipment in the first place? The writer is a musician, with several years' experience as an orchestral conductor, and realizes that it can be done. But how—that is the question.

The answer is, by using devices other than wide changes of volumes in the music to secure effects. It is not impossible to produce music, rich in dramatic values, and pleasing to the listener, by variation of the tempo; rhythmic pulsations, carefully thought out to give subtle framework for the thematic material in the score; ingenious phrasing. It is also important to arrange music for the microphone pickup so there is movement from one instrument to another rather than masses of instruments to gain effects.

By practice before the microphone the musician will acquire the feeling of dynamic ranges, under different room conditions, and will become a joy to the recording engineer.

It is also advisable to use small ensembles before the microphone, producing the music in miniature of an even elevel of volume, which can be made louder or softer electrically, thereby making it easier to match in volumes, when the film is cut. pieces, under the baton of a skilled conductor, in the new art of playing before a microphone, can do some astonishingly good work. Three violins, playing one part, can represent the whole section of a large symphony, when they are properly placed within the critical area.

Ensembles of singers should rarely exceed sixteen voices. When more singers are rquired to please the eye, some of them should appear to be singing, but actually remain silent.

Speaking voices before the microphone should be used with consideration of the same principals, as explained for the orchestra. Speakers should be trained in the art of keeping fundamental voice sounds on an even volume level. and should also be able to speak, without in any way limiting their capacities for expression or characterization, on not less than three separate voice volume levels—soft, medium and loud.

Such voice proficiency in microphone technique can only be acquired by practicing before an iron ear, with a recording system which will play-back quickly. Then the speaker can hear himself as others hear him, note variations of volume level, and make improvements almost without thinking. It is admitted, of course, but not generally known, that no one really knows how his voice sounds to others, due to the differences in human ears, and to the resonance of his own head structure when he talks.

Again, with the voice, as with the orchestra and singers, too wide changes in volumes should give way to rhythms, changes in enunciation speeds, inflection in pitch, and unrelated accents to give emphasis.

Consider now the limited critical range of the microphone as a sound pickup. Contrary to the general belief, the iron ear does not pick up sounds faithfully outside of a limited space around it. Here, again, the cinematographer is reminded of the limitation of his lenses, and

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New Lamp Introduced by the Otto K. Olesen Illuminating Co.

By Otto K. Olesen, *Pres. Otto K. Olesen Illuminating Co.*

WITH the passing of the arc light and the advent of the incandescent lamp for motion picture work all of those connected with picture making should profit from the experience of the past. In other words, we should profit from what we have learned from the arc lights.

History has a way of repeating itself whether in the working out of governments, the waging of wars or the development of lighting equipment. The men who fail to profit by the experiences of the past are the ones who are always found by the wayside eventually.

In the matter of lighting equipment for picture studios, let us look back at the developments in the old style lighting. In the matter of spot, or controlled light we had in the beginning "Spots" of 35 amperes. Next came the 70 ampere spot, then the 120. These, in turn, made way for the 80 and 100 ampere high intensity rotaries and sun arcs.

With the advent of the incandescents along with sound we will see the same evolution take place again, depending entirely on how fast the development of lamps progresses. Certainly, we will not stand still and be content with what we now have. What the future holds in lighting is something none of us dare predict.

Fig. 7

However, we know that lamps at the present time, 3 K.W. or over, are prong base. Therefore, if 3000 Watt is the limit for the mogul base lamp, why not provide for the future by having equipment that is flexible to this condition? Our organization has brought out a piece of lighting equipment which we feel is destined to save the studios an enormous amount of money, in that we have been looking to the future.

One of the advantages of our new lamp is its socket. This socket, to the thinking man in the studio, will instantly declare itself as a great advance in construction of incandescent equipment. It lends itself to the slightest demand of the lamp manufacturer, and can accommodate any lamp from 10 to 10,000 Watts.

Figure No. 1 shows the clamp handle and the mogul adapter can be lifted out as is shown in figure 2. The slip connectors are of the standard type used in studios for the last ten years and are as sturdy of structure as are the adapters.

To illustrate the simplicity of the lamp figure 3 shows a 5 K. W. lamp being placed in the socket. Merely push the two slip connectors onto the prongs, set the lamp in the socket and turn the handle and the lamp is focussed with the mirror automatically.

At this point with the larger lamp accommodation, we must look to the switch and its added capacity, for the larger load. Figure 3 shows one type of switch cover that allows the cable to be separate from the lamp, although this feature is optional.

The 5 K.W. lamp is shown in place in figure No. 4. We also see the switch with cover removed, showing the sturdy construction. This is a **60 ampere** switch, meaning it will accommodate up to 6 K.W. lamp without having to use a 24-inch housing.

To the cameraman this means that every lamp of this type will take a 5 K.W. lamp instantly. There are no delays waiting for a 24-inch. You just take out the small lamp and put in the larger one. If for exterior

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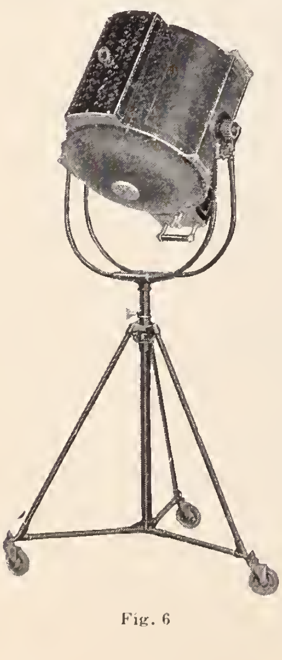

Fig. 6

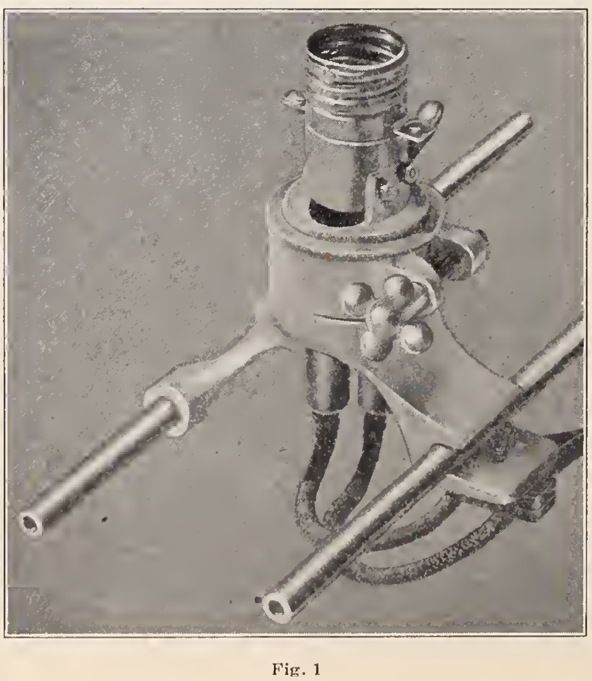

Fig. 1

Fig 5

Characteristics of Motion Picture Studio Light Sources

Presented at the Hollywood Meeting of the S. M. P. E., April 9, 1928— A Transaction

By Loyd A. Jones and M. E. Russell

[Communication No. 358 from the Kodak Research Laboratories. Second and concluding Installment.]

At the present time there is no generally recognized unit of photographic intensity corresponding to the internationally accepted visual unit known as the "international candle." In order to express the photographic efficiency of a source it is necessary to have some unit in terms of which to make this evaluation.

The question of defining a unit of photographic intensity has been under consideration for some years; at the present moment it seems rather probable that the next International Photographic Congress will adopt such a unit that it will be defined as one visual candle power of radiation equivalent in spectral composition to mean noon sunlight. The quality of this radiation, at least from the visual standpoint, is practically equivalent to that emitted by a complete radiator (black body) operating at a temperature of 5000°K. Spectrophotometric analysis, however, shows that the radiation from sunlight differs appreciably from that of the black body in the region between 300 and 450 mμ, this difference being due largely to the absorption of radiation in its passage through the earth's atmosphere.

It seems logical, therefore, to adopt mean noon sunlight as the quality of radiation in terms of which the unit of photographic intensity is to be defined. The spectral composition of mean noon sunlight has been determined with considerable precision by Dr. C. G. Abbott of the Smithsonian Institute; he made 20 determinations at the summer solstice and also at the winter solstice. The mean of these has been adopted to define "standard white" for use in colorimetry.[3] It has been decided, therefore, to express all efficiencies of standard light sources used in this work in terms of mean noon sunlight. In order to do this the equipment was set up out of doors so that the test panel was illuminated by noon sunlight, a few feet of film were exposed under definitely determined exposure conditions. The illumination incident on the test chart was determined in the usual manner.

Flame arcs. The unit used was a Creco Broadside lamp carrying twin arcs operating in series. This was operated on 110-volt direct current, the trim being one-half inch flame carbons as supplied by the National Carbon Company. The Creco unit consists of a white-lined metal housing at the back of which the arcs are located, and on the front of which is mounted a glass diffusing screen composed of narrow strips of Florentine glass. Measuring instruments were connected in such a manner that the current flowing through the two arcs, the voltage across the two arcs, and the line voltage could be conveniently measured. Thus data were obtained from which values of the total energy consumption and the energy consumption in the arc could be computed. This light source is classified as a flood lighting type. The various types of flame carbons used in this equipment were:

2. **White Flame**—National White Flame Photographic (51371).

3. **Pearl White**—National Pearl White Flame Carbons (51371).

4. **Yellow Flame**—National Panchromatic "Y" Carbons (51371).

5. **Orange Flame**—National Panchromatic "O" Carbons (51371).

6. **Red Flame**—National Panchromatic "R" Carbons (51371).

7. **High Intensity Spot.** This consisted of the usual form of high intensity arc mounted in sheet metal housing with condenser lens. The arc consumed 75 amperes and was trimmed with the National high intensity white flame projector carbon with an 11 mm. National Oro tip cored projector carbon as the negative electrode. Tests made with this unit equipped with the usual condenser lens, and then with the condenser lens removed and a silvered mirror placed in front so that the light falling upon the test chart was reflected from the mirror, indicate that the photographic quality of light in the two cases is practically identical. Hence the photographic efficiency values obtained by use of this spot lamp may be applied directly to the various forms of flood units employing the high intensity arc burner as a light source, such, for instance, as the "sunlight arcs."

8. **Sunlight arcs.** No example of this unit was available for use in our studio, and the data relative to visual efficiencies were taken from a paper on this subject by Mr. Frank Benford.[4] The photographic efficiency was considered identical with that obtained by direct test using the high intensity spot light described under 7.

9. **Low intensity arc spot.** The equipment used was a Winfield Kerner unit trimmed with a 1-inch National cored projector carbon as positive electrode and a 7/16-inch Oro tip cored projector carbon as negative. These carbons are of the ordinary soft-cored type containing no flame material and the light emitted approximates quite closely in spectral composition that of a black body operating at approximately 4000°K color temperature. This light may be considered, for all practical purposes, as equivalent to that obtained by using any type of arc employing low intensity carbons, such as Klieg spots, etc.

Gaseous conductor lamps. The experiment used in making the measurements on mercury vapor arcs was kindly loaned to us by the Cooper Hewitt Electric Company, Hoboken, N. J. It consisted of two copy board illuminating outfits. One of these was equipped with two 50-inch mercury vapor tubes, each bent in the form of an *U*. The other unit was equipped with one 50-inch U-tube and one gaseous conductor neon lamp, recently developed by the Cooper Hewitt Electric Company, consisting of a glass tube approximately 1 inch in diameter and 24 inches long filled with neon and provided with suitable starting and operating electrodes. These tubes were mounted in shallow metal housings lined on the inside with a painted white reflector. These units operate directly on 110-volt alternating current line.

It is well known that the light from the mercury vapor lamp is deficient in red and hence in photographic work red objects are rendered as very much darker than is indicated by their visual reflecting powers. On the other hand the light emitted by a gaseous conductor neon lamp is very red in color and red objects are accentuated in

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THE MOVIES REACH COLLEGE

University of Southern California Is Blazing A Cinematic Trail on Our Western Coast by Inaugurating Motion Picture Lecture Course.

By WILLIAM STULL, *A. S. C.*

TO MOST individuals, admission to college is probably one of the proudest indications of manhood attained. Consequently, with the announcement by the University of Southern California of several courses on motion pictures and their related arts, our erstwhile 'infant industry' may be said to have reached its majority.

Compared to other arts and sciences, motion picture production is still young in point of years, but in point of achievement it ranks with the hoariest of them. Conceived in the closing decades of the fertile nineteenth century, developed and matured in these first prolific years of the twentieth, it has compressed into each year more progress and achievement than the more leisurely arts have encompassed in a score. Judged by its progress, screen art is as old as any of its sisters; considering the development of its technique, and the number of truly great works of art left for posterity, it is fully worthy of equal recognition. Now it is gaining academic standing commensurate with its position as an art and as a factor in the life of the world.

It is no longer the purpose of a university to teach its students ancient, dry-as-dust Latin and Greek alone; rather, it is intended to give them a truer appreciation of all that touches modern life most closely, to prepare them for it, and for a career of useful citizenship in whatever profession they may best be suited to. And what one force exerts so great an influence on contemporary life as the screen? What else has become so much a part of humanity as the movies? Wars may rage—empires crumble—rulers come and go; but none of these affect the life of the individual nearly so intimately as does the cinema.

The existence of such a condition makes it the absolute duty of progressive colleges to investigate it, and to endeavor to give their students an understanding of its underlying causes and basic principles. In justice to American universities as a whole, they have tried to do this: some of them have essayed courses in various fields relating to pictures; all of them have shown interest in the problem. And a problem it has been, too, for the art is such a peculiar one, and so new, that no standard means of teaching has been evolved. There are no textbooks worthy of being termed standard; no one competent to teach, other than the men and women actively engaged in the industry itself. There are grave economic problems, too, in striking the fine balance between training sufficient new blood to keep the industry vigorous, and overrunning it with a horde of workers for whom there can be no work.

With this in mind, the University of Southern California and the Academy of Motion Picture Arts and Sciences have mapped out plans for two basic courses. The first, which is now under way, is a purely cultural course designed to give the average student a better appreciation of the pictures which constitute so large a part of his entertainment. The second, which is being organized, is for the limited number who may be found fitted to specialize in active preparation for definite work in the literary and technical branches of the industry. This is being prepared with the utmost care, and all possible precautions to ensure its giving bona fide training to the right individuals, and still preserving the proper economic balance.

Of it, Karl T. Waugh, under whose charge, as dean of Liberal Arts, the new courses come, says, "What the industry needs, and what the University can give, is men and women trained in the fundamental subjects of physics, chemistry, optics, art, architecture, English, dramatics, psychology, etc., with particular application to the chemistry of the film, optics of motion picture camera-work, the psychology of perception and interpretation, the art and architecture of motion picture design, stagecraft, dramatics, and the elements of plot and scenario writing. A school of motion picture sciences may thus be comparable to schools of mining or civil engineering or architecture.

"It is the understood agreement between the Academy of Motion Picture Arts and Sciences and the University of Southern California that in consideration of the University's planning these courses and offering them to duly qualified students, the Academy will give preference to those who have had the training in the courses outlined. In the College of Liberal Arts of the University we have worked out a new and adapted curriculum which now includes three courses, leading to appropriate degrees.

"1. A course in the science and technique of cinematography.

"2. A course in composition, literature and criticism for moving picture scenario and continuity writing.

"3. A course in architecture and the fine arts with major emphasis on (a) architecture, (b) decorative arts, or (c) architectural engineering.

"A course for the training of voice and expression for those arriving at the profession of screen actor is under consideration.

"Library and study facilities for the course are provided at the University, as well as the advantages of a museum of Motion Picture Arts which adjoins the campus.

"The Academy aims to establish a technical laboratory and a research library to facilitate the studies of those who are advanced in the course, while the University opens its doors to those who must receive the necessary fundamental training.

"The first two years' work is in general similar to that in Liberal Arts. During the last two years occurs the major part of the specialization and field work."

Decidedly an ambitious program, but one which, if carried through with patience and moderation, should be of inestimable benefit to the industry as a whole.

The purely cultural course in motion pictures, now being offered as **Photoplay Appreciation,** is intended to serve the double purpose of being a survey course in the subject for those who intend to make motion pictures their profession, and of giving the average student a better appreciation of all that goes to make a motion picture. As it is being given this year at the university, it is a course of lectures by leading figures of the industry and certain qualified professors. It is divided into five parts: first, an introduction, covering the scientific foundations of the art, its early history and development, the theory of silent photoplay, the application of sound, and the current trends and tendencies in the art. Then comes a more elaborate consideration of the important elements of the photoplay: the story, the actor, and pictorial beauty.

The third part of the course comprises lectures on the commercial requirements of the industry, and on the principles of criticism. The fourth part treats the psychological, esthetic and sociological aspects of the photoplay, while the final division concerns itself with a summary of what has gone before, and a discussion of the future of the art. As it is now being given, it serves its dual purpose admirably, but it is probable that in the future the course will be divided into two separate divisions, one for the students whose interest in the subject is from the purely cultural viewpoint, the other an advanced survey

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New Film Process Announced by Consolidated Film Industries

Claim 50 Per Cent More Life and Beauty for Film

A new film process employing a secret formula and a method for coating the emulsion side of film, which the sponsors guarantee will increase the life of an average print by at least fifty per cent, has been announced by the Consolidated Film Industries, Inc. This new method, to be known as Consolidizing, engineers of the company say is based on a formula which differs radically from those which hitherto have been utilized to protect the emulsion side of motion picture film.

The Consolidizing process will be applied to new prints only and will be exclusive with the company's laboratories. The guarantee that the new treatment will prolong the life of prints at least fifty per cent, officials said, is based on proved results obtained in a series of exhaustive tests made at the Consolidated laboratories over a period of several months.

Experts of the company said that the treatment consists of applying a chemical compound to the emulsion side of the film as soon as new prints have been made. The coating formed over the emulsion assures durable protection which preserved the moisture contained in the emulsion of a print in new condition and protects the emulsion from oil, dust and scratching.

Ever since investigation definitely established the causes mainly responsible for deterioration of motion picture prints, engineers and chemists have carried on extensive experimentation to develop an efficient protective agent or process to preserve the necessary moisture in the emulsion, and protect it from oil, which penetrates and stains the emulsion, and dust particles which cause abrasions. The tremendous saving to the industry resulting from such an accomplishment has long been a challenge to the technician and the laboratory worker.

With the introduction of sound film using the film track method, the necessity for such a process has become more pressing. Because due to the sensitivity of sound reproduction by the light process the slightest damage to the film is translated immediately to the reproducer, causing extraneous noises and distortions destructive to the natural quality of the reproduction. So important has become the necessity of keeping sound track film absolutely free from dust and oil spots that extra precaution is urged on all projectionists and those who handle film. One technician suggested the adoption of the slogan, borrowed from another field and made nationally famous by advertising, that "a clean film never squawks."

The protective coating formed by the Consolidizing method is absolutely transparent adding nothing to the density of the film. As a matter of fact, due to the preservation of moisture and protection of the emulsion against oil stains, engineers of the company said experiments proved that added brilliance is imparted to the projected image from a film treated by the process.

A. S. C. Committees Named

President John F. Seitz of the American Society of Cinematographers last week announced the following appointments to the society's committees for the coming year:

Public Relations Committee—John W. Boyle, Chairman; Karl Struss, Joe Dubray of Chicago, Georges Benoit of Paris, Gaetano Gaudio, H. T. Cowling of Rochester, Claude McDonnell of London.

Research and Educational Committee—Alvin Knechtel, Chairman; Victor Milner, Joe Dubray, Ned Van Buren, Douglas Shearer, Hal Mohr, Dan B. Clark.

Membership Committee—Fred Jackman, Chairman; Sol Polito, Ross Fisher.

Social and Entertainment Committee—Hal Mohr, Chairman; John W. Boyle, Fred Jackman.

Production Committee—Dan B. Clark, Chairman; Karl Struss, Elmer C. Dyer, Wm. Stull, Walter J. Van Rossem.

Cutting Movietone Pictures

Something More Than a Pair of Scissors Is Necessary in the Cutting of Sound Pictures Where Perfect Synchronization Is Essential

By Louis R. Loeffler

Film Editor for Fox Studios, who was Chief Editor of "In Old Arizona" and "Thru Different Eyes."

Though the cutting of Movietone film differs somewhat from that of silent film the principle of both is fundamentally the same. A well-cut film, whether it be silent or spoken, is one which embodies smoothness of continuity, proper tempo and the intelligent use of angles and close-ups.

The average cutter of silent films when informed that he is about to be assigned to cut a Movietone feature receives the news with trepidation, inasmuch as he has heard various tales of the intricate problems encountered in the cutting of the film. While these tales are more or less true, they should not discourage the cutter in the least, ... especially if he is a person who is willing to use his imagination instead of relying on cut-and-dried rules.

It is not my intention to write an essay on Movietone cutting, but to give a brief outline of some of the problems that constantly arise in the cutting of both negative and positive Movietone film.

First it must be understood that there are two methods of making a sample print of a Movietone negative . . . . one is to print the sound and the picture on separate films, thereby necessitating the use of two synchronous projection machines . . . . the other is to print both sound and picture on one film. The latter method, though it involves greater mental effort and more work for the positive cutter, is the more practical of the two inasmuch as once the film is cut and ready for a preview perfect synchronization is assured plus the fact that the negative has not been touched in case there are to be alterations in the film. We will therefore concern ourselves with this method only.

I take it for granted that the reader is aware of the fact that there is a difference of fourteen and one-half inches or approximately twenty frames between the picture aperture of the projection machine and the small light aperture of the sound apparatus. Therefore when a print is made from the negative the sound must be printed twenty frames ahead of the picture in order to be certain of perfect synchronization. Consequently when the positive cutter receives his "rushes" from the laboratory the printer has already "pulled up" the sound twenty frames and the cutter must take this into consideration when cutting his film.

One of the greatest problems to be contended with in Movietone film is that of out-of-synchronization, and the first step toward remedying this defect is to determine whether the sound is too far ahead or too far behind the corresponding action. When this has been ascertained a definite bit of action is selected on the film and an X is marked with a grease pencil at this point. Next the approximate position of the sound for this action is located and an O is marked opposite the sound track exactly twenty frames down from this spot. The film is then projected in such a manner as to see the sound track on the screen.

As an example we will presume that the scene to be synchronized is one which shows a man striking a vase with a walking stick. In projecting the film we have learned that the vase is struck by the cane and several seconds after we see the blow we hear the sound for it. Immediately we understand that the sound is too late and must be moved ahead. An X is marked on the frame of the picture which shows the cane in contact with the vase. An O is marked opposite the sound track exactly twenty frames after the point where the sound of the blow is thought to be. Upon projecting the film again with the sound track visible, we immediately learn whether we have found the correct sound because we will see the O simultaneously with hearing the sound of the blow. It will then only be necessary to count the amount of frames between the X and the O to ascertain just how far out of synchronization the scene is. If, for instance, we count twenty-nine frames, we immediately know that the scene is nine frames out of synchronization and in re-cueing it we pull the sound ahead nine frames. But it is not always that a definite bit of action is found by which one can resynchronize a scene.

There are many cases when a scene consists of straight conversation and when such a scene is out of synchronization the only means of remedying it is to first determine whether the sound is ahead or behind the corresponding action. If the former is the case it will be necessary to first determine approximately how many frames the sound is ahead of the picture, and in threading up the projection machine have the operator enlarge the loop that immediately precedes the sound device the amount of frames that the film is thought to be out of synchronization. Upon projecting the film it will be observed that either the scene will have been thrown into perfect synchronization or that it will be less out of synchronization than it was before the experiment. If the former is the case there is nothing more to do but to count the amount of extra frames in the loop and in re-cueing the scene pull the sound ahead that number of frames. If the latter is the case it is only necessary to increase the size of the loop, frame by frame, until the desired result is acquired.

If, however, the sound is too far behind the action it will be necessary to reprint the scene immediately and move it ahead (it does not matter if it is thrown out of synchronization in the other direction just so long as the sound is printed ahead of the action), and then thread up the projection machine and proceed as in the first case.

I think that this entirely covers the problem of out-of-synchronization, and though I have devoted probably more space than necessary on a subject that may seem foreign to the one I set out to write upon, I hope I will be excused for having deviated from my course, and in a later article will endeavor to explain some of the problems that have to do strictly with Movietone cutting.

Some Problems Related to Composite Photography

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of an unraveled rope will be more down to scale. For the gnarled trunks of the old Royal oak trees, an inverted root and base of the California grape vine proved excellent. The foliage of the tree was reproduced by pegging into the upturned root some sprigs of the Juniper bush. The railroad track had to be specially cast because the English track shows a clamp to every tie while the American rails are clamped only intermittently. Close-ups of this miniature demanded correctness to avoid criticisms from audiences in England.

Imagine spending four months and $40,000 on the miniature flood scene in "Noak's Ark," which was incorporated into life size foreground action. The Temple in the middle distance and every house in the city beyond was cast individually from models. They were then set into position in an area 300 feet wide and 250 feet deep. Water flumes were laid underground, emerging at the proper points. Perforated pipes were installed overhead for the rain. Then every house was removed, broken apart and reset with clay in the broken joints in order that the flood would break them up realistically. As a precaution, wires were tied to pull them apart if the water failed, and as a second precaution, dynamite caps were wired to a remote control. An immense tank containing 600,000 gallons of water was built about and to the side of the set.

Three hundred actors were on the life size set in the foreground. One hundred and five skilled men were at the various stations controlling wind machines, rain, flood water, lighting and other effects. Eleven high speed cameras with various focal length lenses were hidden between the foreground set and the miniature. Four normal speed cameras were on the foreground action. The high speeds picked up the individual details. The shot had to be photographed between 11:45 a. m. and 12:20 noon, otherwise the sky backing behind the miniature would cast a shadow. It took nerve to flash the starting signal, for there could be no retakes. It was all over in two minutes, and, fortunately, it was not necessary to retake; but the supervising technician spent four days in bed from the nervous reaction. The Johnstown flood, done a few years ago, was a parallel case with a similar successful issue.

Where long distances are represented in a short depth, a forced perspective is resorted to and consequently miniature buildings have the physical appearance of cubistic nightmares, but you can rest assured they are geometrically correct. For this and other reasons, a trained technician insists upon being left alone and even refuses to let a director see anything until it is on the screen.

I know of a case where the studio equipment provided a gravity railroad, but the scenario called for a train climbing the turns and grades in the snow-covered Alps. So the ingenious technician tipped all the trees, telegraph poles, etc., out of perpendicular and even built all the roadside houses leaning forward at an acute angle to the track. The train was photographed coming down hill, but on the screen it was going up hill.

When glass top shots are photographed simultaneously with the action of the lower portion of the picture, the shadows must be painted to conform to the position of the sun on the lot. This requires a prearrangement with the director as to the time of day he expects to shoot. An improved method is to make the action shot first, and by securing a balanced transparency from the negative, the glass top portion of the scene can be superimposed in the laboratory and thus the shadows of the glass scene can be painted to correspond with those found on the action negative. The portional scene on the glass automatically replaces the undesirable portions of the original shot.

It never rains in California unless a technician leaves

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S. M. P. E. Convention as Seen by Editor

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to us the distortions occasioned by variation in width of the scanning slit and by varying its position. Interesting is a very mild expression.

A real treat was offered the Assembly by Mr. C. W. Hulett, who permitted his tonsils to rest and delivered his paper via what I would call an "Optical Phonograph." He just ran his reproducing apparatus film upon which his lecture was recorded on parallel tracks, eight of them on the same film, if I recall correctly. It was a lecture doubled with a practical demonstration. I don't want to comment upon this, because I want your imagination to soar a little bit.

The Mitchell Recording Camera, equipped interchangeably for variable area and variable density sound recording, was introduced by a brief lecture, illustrated with lantern slides. The apparatus itself was on the floor, and I want to say that it appeared to be a very neat "job."

A quick dash from the R.C.A. projection room to the Photophone Studios in Grammercy Park, where we enjoyed a delightful cafeteria style luncheon and authorization of roaming around the Studio where sets, lighting systems, camera, camera-booth, etc., etc., were exhibited. Our genial friend, Frank Ormston, who is in charge of the activity of this studio, acted as host, and any absentee who knows his good smile and thorough enthusiasm will, undoubtedly, miss not being present.

Due to lack of space, the Convention had to be divided into two sections for this day, and while the section of which I was not part was spending the afternoon at the R.C.A. projection room, I followed the rest of the congenial crowd back to the Park Central Hotel, where I listened to Frank A. Benford, D. K. Wright, T. E. Finnegan, and R. B. Dickson, who, respectively, lectured on Mercury and Neon Lamps, Incandescent Lamps, Classroom Films, and on Fire Protection on projection apparatus. The official banquet was scheduled for that night, and so we donned our dinner regalia and assembled on the Roof of the Park Central. A list of those present and those mentioned officially or in conversation from table to table, would reveal the names of the realm of filmdom.

I am going to punish you, Hal, by sending you a photograph taken at the banquet and let you pick out "Who's Who. So find Mr. Crabtree, the toastmaster; L. C. Porter, the President of the S.M.P.E.; Mr. McGuire, the genial Publicity Director of the Society; Elms, who is greatly responsible for the 70 mm. film; and, last, but not least, King Charney, of the Hollywood Agfa.

The usual speeches were most unusual at the end of the banquet, and as long as I live I will remember the splendid personality, fine voice, captivating smile, and ready wit of Mr. Lee DeForest.

After satisfying the "inner-man" we gathered in front of the screen and admired the "Show Boat"—it was in the wee hours of the morning that Bessie Love was still yelling for her hat in the "Broadway Melody."

A little dancing afterwards?—Of course!

And so Thursday morn came. The Arrangement Committee had been considerate enough to call the meeting for 10 o'clock in the morning, and we all listened to Major W. E. Prosser talk on Motion Picture activities of the Army; we admired the fluency of J. I. Crabtree, who told us of some properties of Fixing Baths; and we conducted, under the leadership of L. A. Jones, a brief but interesting discussion on some Standards which were proposed and accepted by the Membership of the Society.

Due to weather conditions, which forced the Paramount Studios to call on the stages the Companies which were scheduled to work outdoors, our visit to the Studio had to be cancelled from the program. This was an unexpected and sad occurrence, solely due to sound pictures. Prior to the Talkies, Paramount would have done its best to give us a show by keeping indoors as many companies as possible. Sound excluded the possibility of our being admitted in the studio. You know why—and how!

So the afternoon was devoted to more papers, especially those the authors of which were not present at the Convention.

J. I. Crabtree, who apparently is the official "remplacant" of absent authors, graced the resonances of the room with well cultivated tone values and brought to light, among other things, the extraordinary efficiency of our Karl Struss behind the battery of cameras used in "Coquette."

The Academy of Motion Picture Arts and Sciences was present in the form of a "compete-rendu" from Mr. Frank Woods.

Dinner and the final re-union at the Bell Telephone Laboratory Auditorium, where the S.M.P.E. and the Acoustic Society of America were assembled in joint meeting.

It was the first joint meeting of the S.M.P.E. with another society, and it was the very first meeting of the newly born Acoustic Society of America. The event was properly cheered and importance was added to it by the splendid lecture delivered by Dr. H. D. Arnold, Director of Research, Bell Telephone Laboratories. I assure you, Hal, that it was very worth while traveling a few thousand miles to listen to Dr. Arnold and to hear his remarkable demonstration. It would take a volume to describe the thoughts that this lecture awakened in my mind. I want to assure you, Hal, that sound is going to be mastered by men as men now master other physical phenomena.

All in all, it was a very nice Convention—more than nice. It was imprinted with a stamp of Friendship and true collaboration that have characterized all the S.M.P.E. Conventions.

Friendships were solidly bound—old ones were renewed—new ones were created, and the dispassionate, frank, and sincere discussion of the problems which are faced by the technicians of the Motion Picture Industry will, as usual, bear fruit.

After the Convention was over I retired to a secluded spot and buried myself in thought. I thought of the last Spring Convention in Hollywood, a mere year ago; and I thought of this Convention of 1929, and I truly marveled at the progress made in such a short span of time. I thrilled at the thought that I am even so small a part of this great scientific Industry of ours.

Au revoir,

JOE DUBRAY.

A. S. C. Members Win Notable Honors

Charles Rosher, Karl Struss and Roy Pomeroy, members of the American Society of Cinematographers, were signally honored on the night of May 16th, when, at the annual banquet of the Academy of Motion Picture Arts and Sciences, they were awarded prizes for their work during the past year.

Rosher and Struss were given the award for the best cinematography of the year in "Sunrise." Pomeroy was given the first award for engineering effects in "Wings." Rosher being in England, Struss accepted the award for both. The prizes were statuettes of gold and bronze.

A notable array of more than 400 screen world individuals were present at the banquet which was held at the Roosevelt Hotel, Hollywood. William C. DeMille acted as master of ceremonies and made the awards.

Recent Releases of A. S. C. Members

"The Pagan"—M-G-M—Clyde DeVinna.
"Love in the Desert"—F.B.O.—Paul Perry.
"California Mail"—First National—Frank B. Good.
"Honeymoon Abroad"—World Wide—Rene Guissart.
"Saturday's Children"—First National—John F. Seitz.
"Show Boat"—Universal—Gilbert Warrenton.
"The Border Wildcat"—Universal—Joseph Brotherton.
"The Hole in the Wall"—P-F-L—George Folsey.
"The Red Sword"—F. B. O.—Nick Musuraca.
"The Duke Steps Out"—M-G-M—Ira Morgan.
"Not Quite Decent"—Fox—Charles Clarke.
"Yellow-Back"—F. B. O.—Phil Tannura.
"The Squall"—First National—John F. Seitz.

New Lamp Introduced by Olesen

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work on a stage a 2000-Watt lamp will not "bore in" far enough, simply change and put in a 5 K.W.

Due to the added cost, studios as a rule have a limited supply of 24-inch type lamps. But with our new type lamp, each lamp is a potential 24. However, do not let me mislead you into thinking that this lamp will give as much light with a 5 K.W. as will the 24-inch lamp. BUT this equipment with a 5 K.W. lamp will do things that cannot be done with a 24, and will give much more light than the conventional G-48 2000-Watt.

In the first place, a 2000-Watt lamp is only 20 amperes input and will not reach out far and cover any great area. But a 5000-Watt, being two and one-half times as great, or 50 amperes, can be expected to do far more.

Secondly, by using a 5 K.W. on a large set we have the advantage of a "beam," or what the mirror is designed for. This "beam" condition gets away from stryation and lends itself to a small, clean field or spot. Then, too, with the larger lamps comes the problem of heat, and the problem of lamp life.

In this matter of heat our equipment which we are introducing has another feature which we consider a distinct advantage. It is real ventilation. Figures No. 5 and 6 show the ventilation of the main heat stream. Also we see the ventilation holes above the main switch and a corresponding row of ventilation vents or holes at the top of the lamp. This vent causes a circulation of cold air between the shell and the lining of the lamp, which we feel is a feature of no small importance.

Figure No. 7 shows the lamp complete with the 5 K.W. We have featured sturdy construction rather than extreme light weight because a lamp must be able to stand up under the wear and tear of constant usage, and the matter of 4 or 5 pounds difference in weight is of much smaller import than when it comes to long wearing lamps.

We have used a tilt clamp handle which is an automatic device that will be a time-saver in production in our estimation. Figure 8 shows a close view of this. No. 1 in this photograph indicates a leather disk 6 inches in diameter which clamps between the head and yoke

Fig. 2

Fig. 3

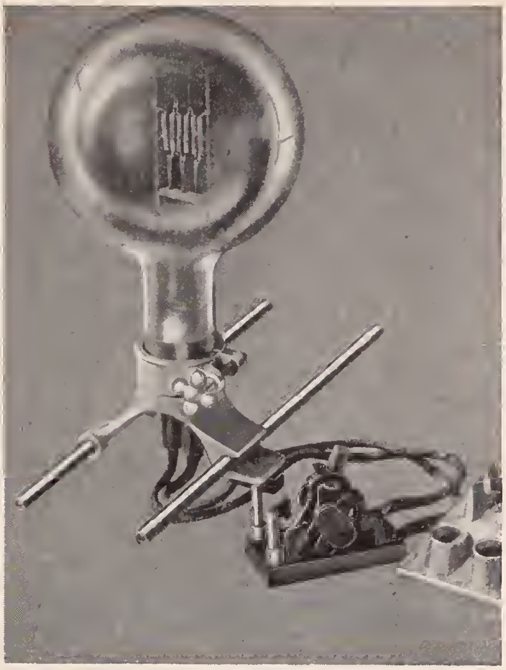

Fig. 4

brackets. No. 2 is the tension handle. This is set to a certain tension in accordance with the requirements and needs no further attention after being set. The lamp may be tilted to any desired angle and it stays in position because it is locked automatically. A heavy spring and a ball-bearing thrust bearing accomplishes this without delays. No. 3 is the positive lock to be used while the lamp is in transit and while handling and rigging or striking the set.

With these improvements, we naturally feel that this lamp should be worth more than the ordinary equipment. But we have decided that we will pass along our developments to the industry at no added cost, so it is priced the same as the other type.

Fig. 8

Some Problems Related to Composite Photography

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a sky backing on the lot overnight. Recently a clever avalanche set had been tested and was ready for the next morning's schedule when ice would tumble down the foreground miniature ravine and in the middle distance, several tons of corn flakes would be dumped upon one of our most pampered stars. It rained during the night and Mount Blanc in the background, covering 1200 square feet of photographic enlargement, was found rolled up in a heap underneath the scaffolding.

Scene 83 required a French cruiser to pass a fortress at a harbor entrance and just miss being blown up by a submerged mine. It seemed more feasible to build a stationary fortress and to move the water and cruiser past it. A roller propelled tank about thirty feet square and a foot deep was built of two-inch lumber. Repeated photographic tests were made but the exploding dynamite just under the water's surface did not seem to throw the explosion high enough. About four in the morning, when everyone was exhausted, the exasperated "powder man" weighted an extra charge and sank it to the bottom. Twelve inches of water happens to offer more resistance than a two-inch plank. Consequently, when the explosion occurred, 6500 gallons of ocean landed on the floor of the stage and the cruiser had nowhere to go.

There is a slogan among the technicians "It can be done," and among the producers "Do it."

Outside of personal experiences, I am indebted to the trained artisans of the industry for much of the information given. Among my contributors are Ralph Hammeras, winner of last year's Honorable Mention Award of the Motion Picture Academy of Arts and Sciences; Fred Jackman, technical supervisor of "Noah's Ark;" Alvin Knechtel, E. Roy Davidson and Ned Mann.

SWITZERLAND

On March 8th one of the Zurich Cinema Theaters, "The Orient," advertised the projection of a sound film, the first talking picture to be seen and heard in this country. Tickets were to be sold five hours in advance of the performance in anticipation of the rush.

GAME IN THE GOBI

J. B. Shackelford, A. S. C., Returns from His Fourth Trip to Asia with the Roy Chapman Andrews Expedition.

By J. B. SHACKELFORD, A.S.C.

[*This little sketch of life in the oldest part of the world is done in the spirit of fun, by Mr. Shackelford who, as a globe trotter is in the class of Herford Tynes Cowling, John Dored, John W. Boyle, Jack Smith and others. Here Schack takes a good humored shot at the predatory male whose greatest joy is to have himself photographed with one of his quarry. In a future issue Mr. Shackelford will give his impression of the Gobi and the scientific work done there by the Chapman expeditions in the interest of the Museum of Natural History of the City of New York.—Editor's Note.*]

For the luva Mike, don't tell the Missus that you are going to print the whiskers. She ran across some of the portraits one day and oh, boy! Was going to tear up the whole lot, negatives and all.

Said she: "For heaven's sake don't you **ever** let any one see those terrible pictures—just like you men—you'd all revert back to the stone age if it were not for us wimmen, etc., etc." Maybe she's right, but it is pretty sweet to get out in the big open spaces once in a while and clip the ole hair close, let the whiskers grow and forget all about 'stacomb,' razors and face creme—especially in the Gobi desert.

Top—at work in camp. Right—The Akeley all set up and nothing to shoot. Left—Close-up photography on a dinosaur fossil. Below—Bathing costume in the Gobi. Note size of bath-tub and non-skid soap.

Some folks think it is a lot of terrible hardships, privation and danger, but this was my fourth trip over there and even with the sandstorms, bandits, bitter cold in the early spring to 145° above in the summer, one does get used to it. Exploring new country every day, hunting mountain sheep, jerboas, ibex, wild ass, antelope gazelle, geese, ducks and grouse; photographing the native life, digging up ten-million-year-old dinosaur eggs and fossil bones as big as a man's body; Chinese servants waiting on you hand and foot, three squares a day and more (some days); no traffic cops nor boulevard stops—yes, it's a tough life.

Speaking of hunting, I have heard of the mighty hunters and their lions of Africa, their tigers of India and Siberia, their Ovis Poli of the Tibetan Steppes, their kodiak bears of Alaska, their whiffle hens and what nots, but for a real thrill and test of daring I decided there was just one more big thing to do besides washing an elephant. Give me a big sarafi of gun bearers and my arsenal of trusty weapons and turn me loose in that big back country away up beyond in the haunts of the giant Jerboa of Mongolia, the most ferocious species alive today.

Well do I remember my first Jerboa hunt. It was a glorious day when I fared forth with the pick of guides, gunbearers and Jerboa hunters. It was just at the crack of sunset when we set out afoot across the land of the dune dweller in search of this nocturnal beast, for this fierce creature roams afield only at night and the thrill of hunting the giant Jerboa in utter darkness can little be imagined by one who has never experienced it.

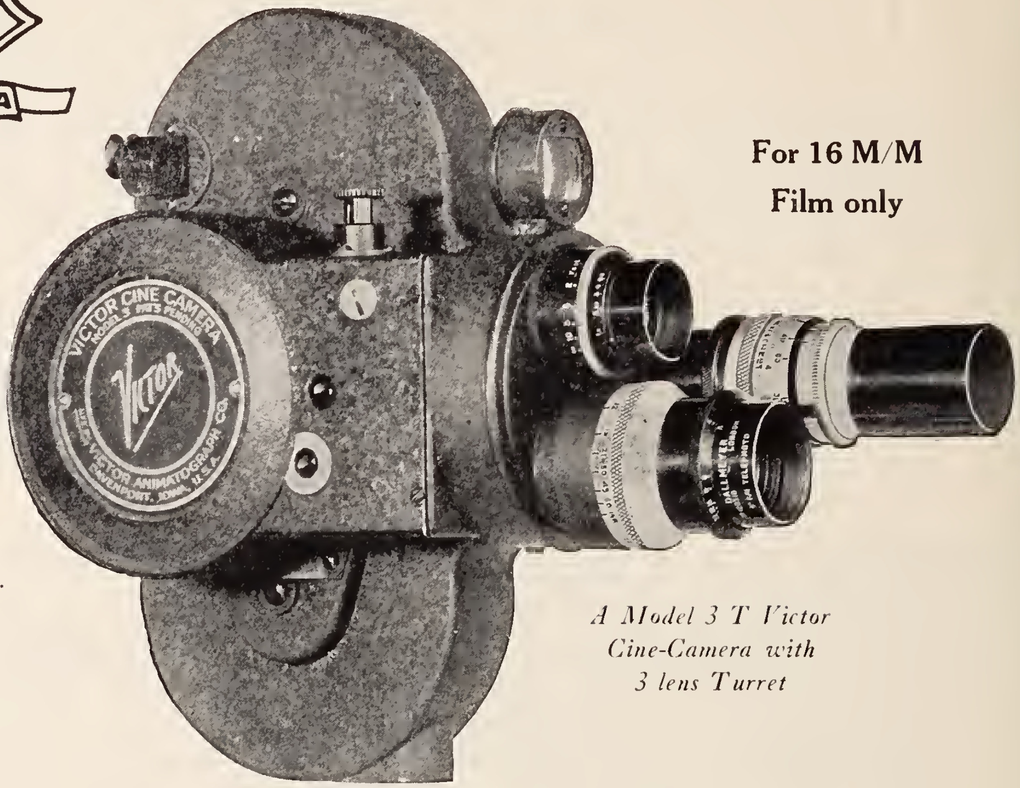
Our progress was painfully slow across the untrodden wastes till finally about midnight we reached the habitat of the Jerboas and stealthily approaching their caverns we listened for the weird night cries that would betray their secret feeding ground. Faintly in the distance we heard the call of one Jerboa to another as if to warn its mate of approaching danger. It was a cry that made my spine crawl and my hair stand—a long mournful, shuddery cry, like the rapid approach of a motorcycle siren. We clutched our weapons, for those were tense moments, and laboriously crawled inch by inch, till at last we reached a high knoll where we could overlook the valley of these giants and select a head for a trophy of this never-to-be-forgotten hunt.

With bated breath, for we were practically exhausted by our long climb, I drew my binoculars from the case and began a survey of the situation. Sure enough, there they were, feeding on the lush growth in the valley below, the weaker of the herd in the center and surrounded by the powerful males for protection. There

Concluded on Page 34

VICTOR
CINÉ CAMERA

For 16 M/M Film only



A Model 3 T Victor Cine-Camera with 3 lens Turret

For Normal and Slow MOTION Pictures!

The Victor Cine-Camera is the first and only Camera taking both normal and SLOW-motion pictures.

Requiring no other adjustment than a quick turn of a button, the Victor Cine-Camera is the only 16 m/m motion picture camera made that permits the taking of both normal action and SLOW-motion pictures on the same film, without the need of a special attachment.

Through an entirely new and ingenious principle, a hitherto impossible range of speeds with stop-action for single exposures, is obtained with one mechanism. Normal, for natural action pictures. Ultra-speed, for SLOW-motion pictures. Half-speed, for pictures in very poor light.

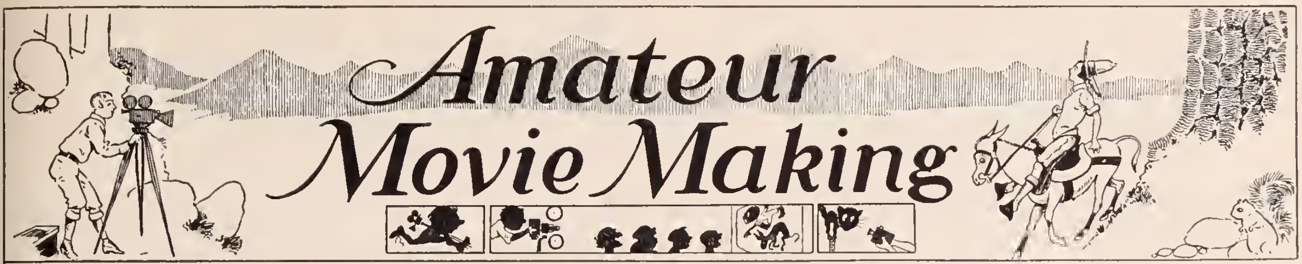
Made in two different Models, the Victor Cine-Camera may be obtained either with the usual one lens equipment of the Model 3 or with the convenient three lens turret of the Model 3 T which makes possible the alternation of long distance shots with close-ups.

Ask your dealer for a demonstration. Then you'll first fully appreciate the many excellent qualities of the Victor Cine-Camera.

Victor Animatograph Company

Main Office and Factory
Davenport, Iowa, U. S. A.

Branch Sales Office
242 West 55th St., New York



As Summer Comes

AND now it is June again! Vacations are in the offing, and thoughts of picture-making once more come to the fore. While some people here and there have been fortunate enough—or enterprising enough—to be able to shoot almost as usual during the winter, most of us have found only the time to make an occasional scene, and to edit last year's output.

That's one of the good things about winter, that change of activity from active production to thoughtful contemplation of what has already been produced. If past work is carefully studied, one can usually find plenty of room for future improvement. For instance, that matter of exposure. How many of us can be satisfied with our results there? How many forget last year that the same changes of season that brought the warmer weather also brought an equal increase in the strength of the light?

There's something for everyone to remember, especially those who have been shooting the winter through. The light doesn't look so different, but how differently it does affect the film! Unless we keep this in mind, we're likely to get a most discouraging crop of flat, burned-out negatives of the very scenes we most cherish.

A good rule for the amateur cinematographer to remember is to cut the diaphragm down at least one stop smaller than would be right for the same scene during the winter; but that's hardly a help with the new and unfamiliar subjects we're likely to meet on our vacations, during June, July, August and September. A more specific suggestion is to stop down to f.16 for sea, sky and beach scenes, for mountains or distant landscapes. if the day is bright. If it isn't, use f.11, and if it's really dull, open up to f.8. For open landscapes, and all ordinary action where there is no heavy shade, f.11 on a bright day, f.8 on darker days, and f.5.6 or f.6.5 on really cloudy ones. If part of the field is shaded a bit, as by trees or houses, f.8 will do the trick, unless the clouds call for the wider openings of f.5.6 or f.6.5; of course heavy clouds demand f.4. If the scene be wholly in the shadow, the various degrees of light require respectively f.5.6; f.4; and f.3.5. Where the shade is very heavy, bright days require f.4, hazy ones f.3.5, and really dull ones demand either an f.1.9 lens, **wide open,** or a reduced camera-speed—which isn't recommended, due to its effect on the action.

If any of these scenes are tried earlier than two hours after dawn, or later than two hours before sunset, the increased yellow content of the light demands that the next larger stop than the one recommended be used. All of this is a safe rule to follow anywhere except in the tropics, where special conditions apply, and for which special, individual advice is the only safe rule. Through the Technical Department, the advice of several A. S.C. members who are experienced in tropic photography is available to individuals contemplating work under such conditions.

Then there's that matter of color-rendition. A great part of the visual beauty of most scenes is the contrasting color-values of the different objects and planes. Despite the perfection of ordinary film, it will not give the same rendition of colors that the eye sees. Probably last year's vacation films showed that! The beauties of the Yosemite, the glories of the Grand Canyon, the verdant quietude of the Adirondacks, all depend for their greatest beauty on color and tone-contrasts which are impossible to render in ordinary film.

The answer is, of course, Panchromatic film, which is now available almost everywhere for both 16mm and 35mm cameras. Its use is bound to bring a sharp and immediate improvement in all sorts of work and regardless of the skill of the user. It is a mistake to believe that filters must always be used with "Pan." They are, it is true, a great help; as a rule, they are needed to get the fullest benefits from the film; but they are not by any means indispensable, and in some cases they are a positive harm. In portraiture close-ups, for instance, they should never be used, for they make flesh tints unpleasantly light, and often do disconcerting things to a feminine subject's make-up. Yet, unfiltered, "Pan" gives markedly improved renderings of tone and color, but to utilize its full capabilities, some filters are advisable, though over-filtering should be avoided. While some of the professional cinematographers maintain an assortment of several dozen filters, the amateur, of course, need use but two or three. Probably the most useful pair are the Aero No. 1 and the K-2. With them almost every condition ordinarily encountered can be successfully met. For most scenes, the Aero No. 1 (which is about midway between the K-1 and the K-2, and more practical for general use than either) is sufficient, but when shooting through any considerable haze, or on subjects where more marked correction is needed the K-2 is very useful. In a word, Panchromatic film will do more than almost any other thing to add beauty to one's film.

Framing the Picture

But there is one thing that affects the results even more than the use of "Pan" or any other mechanical aid, and that is the user's brain-work. The modern cinema camera is a marvellous little mechanism, but it is still a machine. It cannot think for itself. It cannot choose what it shall see and what it shall ignore; that is for the user to do. Therefore, if one wants beauty on his screen, he must be sure that there is first beauty placed before eye of his camera to be recorded. He must be sure that there are no jarring, discordant notes in any part of the picture, that the action is intelligent and attractive, and that the whole forms a pleasing composition.

Composition is no highly involved mystery, comprehensible only to great artists; but is a simple, workable practice of always carefully considering each scene, to be sure that it will be pleasing in itself, before ever turning a crank. In discussing the subject, Victor Freeburg remarks, "A remarkable thing about composition is that it cannot be avoided. Every picture must have some kind of arrangement, whether that rrangement be good, bad, or indifferent. As soon as an actor enters a room he makes a composition, be-

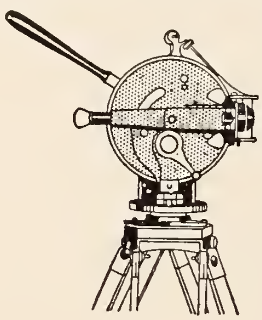
cause every gesture, every movement, every line in his body bears some pictorial relation to everything else within range of our vision. Even to draw a single line or to pick a single point upon a sheet of paper is to start a composition, because such a mark must bear some relation to the four unavoidable lines which are described by the edges of the paper."

Thus we are all condemned to make compositions, whether we want to or not, as long as we use any sort of camera. As this is the case, we might as well make good ones while we're at it. The first step, of course, is in making sure that the picture forms a harmonious whole. Then, there are endless possibilities in emphasizing some one part of the picture by means of the rest. The simplest example of this is in the use of convenient objects in the foreground as a natural "frame" for the rest of the picture. It is simple, and, being simple, is enormously effective.

At least one or two examples of the use of artistic framing can be found in any well-photographed film drama. The amateur, on his part, may well use the principle of framing to add beauty to his own scenes. Almost everywhere a little thought will disclose possible natural frames. A group of fair-sized trees, a couple of hundred feet from the action, makes an effective frame, if the camera be placed twenty or thirty feet behind them and focussed on the action rather than the frame. Arched windows, colonades, overhanging branches and hundreds of other familiar objects can be used to make excellent frames for action; and, when properly selected, can be most helpful in giving emphasis to whatever part of the picture the important action is to occur.

Of course, the frame must not be emphasized for its own sake; the focus must almost always be set for the action, and the exposure also for the action. The frame, if left thus to take care of itself, will do so, and be a most powerful aid to composition, and to the proper emphasis of the important parts of the scene. And, after all, the purpose of any scene must be to tell a story, to tell it quickly, economically, and beautifully; and to do this, the thing to be remembered is that a picture, to accomplish its entire purpose, must be more than a mere visual record. It must be a pleasing succession of moving patterns of beauty, for in pictures, as in nearly everything else, the beautiful movement is the most efficient.

One has only a certain amount of energy available when viewing a picture, and if the beauty of the scene is so craftily controlled as to make the actual **looking** and **seeing** easy, there is just that much more available for grasping the meaning of the scene, and for enjoying the emotional result conveyed thereby.—[The Editor.]



The Movies Reach College

Continued from Page 16

course for those who plan to make motion pictures their profession.

Due to the enormous popular interest in motion pictures, and the eagerness of practically all of the major educational institutions to present to their students such a cultural course on the subject, there are being evolved from this course material and methods for its extension to other institutions. From the lectures, which represent the combined efforts of the best brains in the industry and the University, there are being codified textbooks which should be of such merit as to be regarded as standard works for a long time to come. In the classrooms are being evolved methods of presenting the subject-matter most efficiently and to the best advantage.

Of course the feature contributing the greatest popular appeal to the course, the actual presence of the lecturers—men and women who have mastered their craft, and in so doing made their names household words the world over—obviously cannot be repeated at all of the hundreds of colleges throughout the land where the course will be in demand.

However, in place of the actual lecturers it is planned to send Vitaphoned reproductions of their lectures to the various schools, using, until the various institutions have found it advisable to make their own sound installations, a most ingenious portable apparatus which has been specially designed for the work by the Western Electric engineers.

In this way it is hoped that while the actual lecturers can be had only at Southern California, the lectures will be available to all universities interested in the work. The Southern California institution will, however, due to its location at the heart of the industry, undoubtedly remain the fountainhead of these courses—the laboratory where new methods are evolved, and from where they are passed on to the rest. Of course, no other university in the world can hope to rival the advanced courses now developing there.

Clearly, both of these courses are of vital importance to the industry, and deserving of its whole-hearted support. The value of the advanced course is at once evident; but the other, the purely cultural one for the average student, naturally gives rise to the question, "Why should we work to give all this information to people who never expect to get nearer to us than the theatres that show our pictures? What practical use it it?"

The answer lies in the question itself. If they come that close, they are directly customers of everyone in the industry. If these customers can be educated to be a market for better pictures, the whole industry, and consequently the individuals composing it, will benefit proportionally.

The screen has been criticized for the juvenility of many of its stories and themes: the defense has always been that the average audience was juvenilely minded, and demanded entertainment becoming to its mental level. If the mental level of the audience be raised, if ever so slightly, better pictures are possible: and better pictures will attract thousands who have not previously attended the cinema just because of its juvenility. And this increased audience will be directly reflected in better working conditions throughout the industry, which is a very practical result indeed. If there is even a possibility of doing this by such work, is it not worth while?

Of course, the total number of graduates from all the colleges in the country are only a small part of the great daily film audience, yet they have a great influence over the whole: they are the one small lump of leaven that can leaven the whole mass. It has been said that the value of George Pierce Baker's celebrated play shop at Yale lies not in the fact that it frequently produces a notable playwright, but in that it produces every year several score young men who have been so trained in the art of the theatre that they know and want the best. They probably are never active in the professional theatre, but as each of them goes his way, he becomes in his own community the nucleus of a similarly-minded group of people who not only serve to make possible the art—and little-theatre movements, but also directly support the professional stage in the form of repertory theatres and the better travelling companies.

If that has been true of this one group, what can we not expect of such groups as this at Southern California, and its inevitable extensions, dealing with a subject so firmly entrenched in popular favor and interest as motion pictures?

No one can deny that for the last few years the moving picture industry has been passing through a period of financial depression. Box-office receipts have fallen off alarmingly the world over, and in consequence the personnel of the industry has suffered. The talking picture has been a financial godsend to the industry, but it has not answered the cry for better films. Silent or talking, better films are the industry's greatest need today. They are artistically possible, but unless it can be surely known that there is an adequate market awaiting them they may not be held commercially advisable by the production heads, despite the obvious, crying need for them. But with such courses as these to educate a truly appreciative audience that can definitely recognize better film, **and that will shop for its entertainment as it does for any other commodity it buys,** they are inevitable, for they will have the assured market they need. With their coming will also come remedies for the many ailments that afflict the industry today. And with the removal of these troubles we may expect better economic conditions in the industry than ever before, and greater artistic achievements than even the greatest heretofore; the full flowering of the screen into its long-heralded place as the one universal and all-embracing art-form for the ages.

ITALY

An agreement between the Italian National Moving Picture Association and the German U.F.A. has been signed, through which Italian Talking Films are guaranteed protection in Germany. The agreement embodies a mutual exchange of German and Italian Films.

INFORMATION FOR AMATEURS

Amateurs—Send your problems to this department and have them solved by the world's finest cinematographers—the members of the A. S. C. This is your department. Our aim is SERVICE. Write us and find your answers here.

Question from W. McG., Los Angeles: Is there any suggestion you could offer regarding the possible storing at my home of 40,000 feet of 35 mm film? That is, that would not conflict with the collection of insurance policy money in case of fire. This film is highly inflammable and quick-burning. If I had it on the place and evidence of same were discovered by the L. A. insurance fireboard could they sue me?

Answer: Common sense should prevail here. Get in communication with your insurance company and with the fire commissioner's office and get the regulations and abide by them. No man should want to endanger his life and property or that of his neighbors by having anything in his home that would cause fire. Your question regarding a 16 mm projector will be answered direct by letter.

Question from M. V., of Sand Lake, N. W.: (1) I have a Sept. camera with lens stylor F3.5. This camera works at 60th of a second. Do I have to make the next larger stop than the Cinephoto exposure calls for to make the right exposure?

Ans.: Yes. You will find an arrow governing the Eastman camera on the Cinephoto meter. Turn this until the arrow points directly to the stop indicated on the meter. Then make the next larger stop for your camera.

(2) Can Vitacolor filters be used with success in standard cameras, or are they only for 16 mm cameras?

Ans.: The Vitacolor officials tell us that for the present they are only for the 16 mm cameras, but that eventually they will be put out for the standard size.

(3) I have seen some pictures in color, such as "King of Kings." Are they made by handpainting, or how?

Ans.: "King of Kings" was made by Technicolor process.

(4) I am told that the American Society of Cinematographers has a school for teaching the art of the cinema. If that is true, do they teach amateurs who want to become professional cameramen, and how much is the cost?

Ans.: No, the A.S.C. does not maintain such a school.

Question from L. R. T., Chicago, Ill.: Why is a yellow filter advised when using Panchromatic film for landscape work?

Ans.: Panchromatic film has an excessive sensitiveness to blue and violet as compared with the eye. For this reason a yellow filter is used when you wish to eliminate the excess effect of blue and violet, these two lights being absorbed by the yellow filter.

Question from H. L. R., San Antonio, Texas: I am a bit puzzled about diaphragm stop. I have had many pictures appear flat and burned out, when I thought the sunlight was not too strong, can you suggest what I should do?

Ans.: You will find this matter discussed at length under the amateur heading in this issue of this magazine, with a diaphragm schedule well explained.

Question from Mrs. R., Los Angeles, California: Is there any device now on the market which can be used by amateurs for making home talkies?

Ans.: If you will write to the Q. R. S.—DeVry Corporation, Center street, Chicago, Ill., they will no doubt be able to assist you. They are producing a Cine-Tone device which is said to be very satisfactory for home experimental work. The Home-Talkie Machine Corp., 220 W. 42nd St., New York, also makes these devices.

THE FACE ON THE COVER

A Close-up of Richard Dix, Which Reveals a Few Facts Not Generally Known

ONE reads so much about beautiful young women and handsome young men leaving the farm and walking smack into a fat contract in pictures that it is a positive relief to find a screen actor of real merit who has had to really work to reach the pinnacle of success.

Such a man is Richard Dix, the star whose face adorns the cover of this issue of the American Cinematographer. And the best thing about Dix is that he admits that he has walked New York's Broadway without two nickels in his pocket, wondering where the next week's room rent—of only two dollars—was coming from. That is a healthy sign: when one of our stars admits past poverty.

To know Richard Dix is to know a real man. He cannot walk down the street but what scores of beautiful women who see him have temporary heart trouble, but it gives Dix no concern. Acting with him is a profession, just as practicing medicine is just a profession to a physician. Posing in hotel lobbies or elsewhere is not in Richard's line. Perhaps that is one reason why success is his.

Dix was born in St. Paul, Minnesota, and according to family plans was supposed to be there now as a physician. However, Dix had other ideas after playing a part in a dramatic production in which he spoke one line as he dashed across the stage with a spear in his hand.

But Dix's father was old-fashioned. He believed that no actor was anything but something that is no-good. So, there were to be no actors in his family. Dix was born with the name "Brimmer," and his father decided that the name of Brimmer would never appear on a theatre program. Dix was of another opinion—but did his father the favor of changing his name, so the family escutcheon was unsullied, as it were.

Dix started life, after quitting high school, by working in a bank. But he secretly studied dramatic art at a dramatic school at night. Then the great Southern gave Dix a hearing and also an offer of $18.00 a week to go on tour with him. But Dix's father stopped that. Finally, Dix consulted with his brother and joined a St. Paul stock company. After amassing $24.00 in cash and some clothes, he headed for New York where he knew real want until he signed with a Pittsburgh stock company.

Life from then on was a matter of struggle for Dix whose salary ran all the way from $25 to $50 a week when he worked. But he had vowed never to return home until he was successful, so he stuck. And then came the movies, as the old title writers would say, and Dix landed so well in "Not Guilty" that he was given the lead in "The Christian." All the companies wanted him then, for his performance in that picture still stands out as a masterly one.

Since then Dix has known success—and his father has known what it is to be proud of his boy. He forgot his aversion to things theatrical and even came to California to live where he could watch his boy at work. Nothing more need to be said about Dix and his acting. The world knows him and cheers for him. And Dix takes it modestly—and continues working just as hard as he did when struggling for his chance.

Dix says a lot of credit for his picture success is due to his best friends, the cinematographers. "Many of the finest ideas that have been given me," says Dix, "were given by the men who photographed me. And without their marvelous ability at lighting and photographing me I hate to think what the present might have held. The cinematographers of today are master craftsmen to be admired by all."

A Complaint

In the May issue of the American Cinematographer a story appeared in which credit was given a certain person for the designing of the Fox-Case Grandeur camera. Since the article appeared the editor has received a letter from H. F. Boeger, president of the Mitchell Camera Corporation, calling our attention to this and explaining that the statement is incorrect.

"Please permit us to correct this misleading statement, by saying that the camera mentioned was built by ourselves," states Mr. Boeger in his letter, and continues, "and is nothing more or less than our regular Hi-speed camera in all its construction, simply enlarged to handle the Grandeur film, and contained no new engineering designs.

"This person," continues the letter, "was in our employ as a draftsman at the time, on detail drawings for this camera under the direct supervision of our Mr. Mitchell, under who's personal direction the drawings were completed."

[Errors and mistakes unavoidably find their way into any publication at times, and we are pleased to run this statement from Mr. Boeger and express our regret that the error occurred.—The Editor.]

Lighting the Big Shots in Chicago

Continued from Page 5

lights with Chrome-plated parabolic reflectors, and six 18-inch Searchlights with Chrome-plated parabolic reflectors.

The first problem with which we were confronted was the placement of the equipment. Every available inch of space was filled with seats, sold at high prices, which prevented our using any space which would require the removal of any of these seats. It was decided to build a platform, 40 feet long by 16 feet wide, between the two balconies, suspended in such a way as not to obstruct the view of the customers. As there are no posts or pillars in the building it was necessary to suspend this scaffold by steel cables from the upper balcony. The building being in a state of construction with hundreds of workmen rushing to finish the job in time for the opening of the fight, it was impossible to start the erection of this platform until after twelve o'clock noon on the day of the fight. That meant less than eight hours for the erection of the platform and the complete set-up.

Only alternating current was available, and two legs of 1,000,000 circular mills cable, each 300 feet long, brought the current from the transformers to a specially constructed switchboard on our platform. The current used was about 1000 amperes.

The lessened efficiency of the lamps burning on alternating current made the penetration of the dust-laden air most difficult. As the building was not yet complete at the time of the opening, the air was a fog of cement dust and this was by no means lessened by the tobacco smoke. To cap the smoke nuisance, shortly before the beginning of the final and main bout, the roof of the auditorium burst into flames. Fortunately, there was no panic, as a hundred firemen soon extinguished the blaze. This smoke addition made our job even more difficult. The accompanying photograph will enable you to judge the success of our efforts.

Predicts Cino-Spectrometer Will Eliminate Errors

Inventor of New Device Gives Additional Details Regarding the Uses and Methods of Using the Invention He Claims will Remove Chance of Human Error

By R. E. Nauman, *Electrical Engineer with the Otto K. Olesen Co.*

[This is the second and final installment of Mr. Nauman's article dealing with the device he has invented and for which he has applied for patent. The article is the original description written for the patent office.—Editor's Note.]

THE present practice of developing is for the laboratory men to take several sections of a film and develop these for different lengths of time, examining the negatives to see which is most satisfactory and then developing the whole film accordingly. As this procedure is dependent on the judgment of the eye it is very faulty.

Presuming with my meter that the camera indicates say, four units of light in taking a picture and developing table shows that this would require a number 6 developing procedure, which would be utilizing a standard developer at a definite temperature for a fixed period of time; and presuming that another film showed that a 3.5 light unit had been used and the table indicated that this would require 6.5 units in developing, the developing may be done accurately without prior experimentation and thus for different lights used in photographing obtaining substantially standard negatives in accordance with such light quantities.

The printing of the film may be regulated substantially as follows, having reference particularly to Figs. 6 and 7:

These figures do not attempt to indicate the structural details of printing machines, but merely some of the essential features. A printing lamp is designated by the numeral 50, the negative by the numeral 51, the positive film by the numeral 52; the light passing through the negative and printing on the positive in the usual manner. In order to record the density of the negative, I mount my spectrometer designated by the photo-electric cell 53 so that light reflected from a mirror 54 and passing through the negative affects the photo-electric cell and hence the meter of the cino-spectrometer; such construction being indicated in Fig. 6 utilizing the circuits of Fig. 8.

Fig. 6

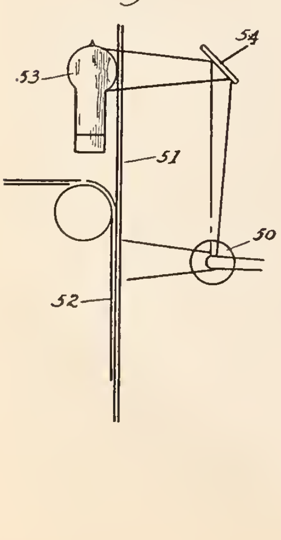


Fig. 7

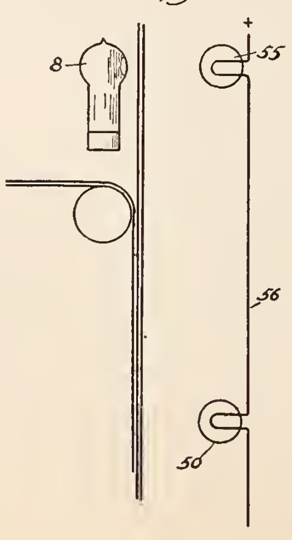


Fig. 8

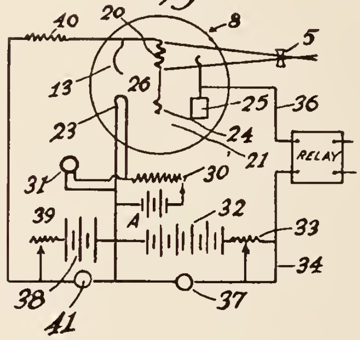
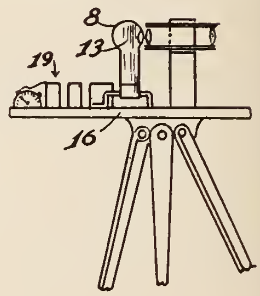


Fig. 9



As it would require considerable change of most printing machines to install a reflector to project some of the light from the printing lamp through the negative, for some types of printing machines I find it of advantage to utilize a second standard lamp 55 which projects through the negative directly on the photo-electric cell. This lamp and the printing lamp 50 are preferably in the same circuit indicated by the numeral 56 so that any fluctuation in one lamp due to changes of voltage gives a fluctuation in the other lamp and hence indicating not only the relative amount of light passing through the negative, but as the negative is running substantially uniform, the fluctuation in the lamps.

The circuit of Fig. 8 is substantially the same as that of Fig. 3 and hence need not be described in detail, and operating a relay for control purposes.

The manner of using my cino-spectrometer in printing is substantially as follows:

In the installation of Fig. 6, the printing lamp would preferably be kept at a constant voltage and thus project a more or less uniform quantity of light through the negative and reflected from the mirror 54 on the photo-electric cell. As the film changes in density this is recorded on the meter and as the printing lamps are generally provided with an iris type of light opening, this may be varied to either increase or decrease the amount of light shining through the negative on to the positive film or else the voltage of the light may be changed to increase or decrease same. These features are intended to be manually controlled or automatically controlled.

Moreover, by means of a table or chart prepared in accordance with the meter readings, the iris and the voltage of light may be set to give the desired printing as has been ascertained by prior experiment and the empirical tables or charts.

In Fig. 9 I show a mounting on my cino-spectrometer particularly suitable for reading the reflected light from a theatre screen. The light from a projector would be thrown on the screen preferably without the interposition of a film and a reading obtained. These readings vary greatly in different theatres in accordance with the type of screen used indicating the reflective power and hence to a certain extent the degree in which a picture will be visible thereon. Therefore by means of suitably prepared tables the voltage of light from the projector may be changed in order to give the proper light.

Another procedure is to project the light through a film and then read the reflected quantity of light and by means of a suitable definition of projector light value accompanying the film adjust the projecting lamp to correspond.

By obtaining the reflective value of screens in theatres and by testing films for projection to obtain their transparency value it will be possible to standardize the films to a greater extent than is now the case as when a film is released a specification will accompany same stating the power of lamp required for different distances of projection and the type of screen required to give reasonably standard effects.

In describing the manner of using my cino-spectrometer in taking photographs I have referred to a manual control of the iris, however, it will be a relatively simple matter to control the iris automatically and instead of using a meter an electric relay could be utilized. This relay through electrical mechanism opening and closing the iris in accordance with the change in light values of the scene being taken.

It will be apparent that my cino-spectrometer may be used for a great many features in the moving picture industry such as in trick photography, double exposure, photographing through glass screens or the like. Moreover, it has been found that paints are required to be matched and that this is a difficult operation on account of the different photographic effects of apparently somewhat similar colors. Therefore with the cino-spectrometer I can obtain practically duplicate paints for different scenes at different times and different plates.

In describing the printing of pictures I show a method of obtaining readings to determine the transparency value of the negative and show how the printing lamp could be varied to give substantially standard positives from a varying negative. This can also be arranged to be done automatically by utilizing a relay instead of the meter and changing the voltage of the lamp in accordance with the changing intensities of light required. Also the iris of the printing machine may be varied automatically in accordance with the changing conditions of the negative.

The cino-spectrometer would therefore find uses in testing the actinic value of different lamps or where arc lamps are used for testing the proper arc to obtain the best value for photographic purposes or for projecting pictures. Generally it may be stated that the cino-spectrometer may be utilized for testing light from a direct source or reflected or transmitted through such material as a film or the like.

It is believed from the above that many other uses of my cino-spectrometer will be apparent both connected with the motion picture industry and in other lines. Such changes in adaptation of my invention will be within the spirit thereof as set forth in the description drawings and claims.

It is to be understood that where the photo-electric cell is used in connection with a camera, that it may be positioned to receive the light which falls on some surface on which the camera lens would form an image, whether this be on a ground glass, translucent material, a reflecting surface or transparent material.

By substitution of an electric relay for the meter 35, a camera iris may be automatically controlled, the iris being operated by suitable electrical mechanism. Also where electric motor driven cameras are utilized the operation of the camera may be controlled by such a relay.

It will also be understood that the lamps 50 and 55 of Fig. 7 may be arranged in series as illustrated, or parallel. The printing lamp is controlled by the indication of the effected light on the photo-electric cell from the lamp 55.

Having described my invention, what I claim is:

1. In the method of taking photographs comprising determining the photographic value of light by a photo-electric cell, and regulating a camera in accordance with such determination.

2. In the method of taking motion pictures, focusing the light from the scene to be depicted on a photo-electric cell, determining by electrical means the photographic value of such light, and operating a camera in accordance with such determination.

3. In the method of taking motion pictures comprising focusing a camera on the scene to be photographed by means of the same lens, focusing the scene on a photo-electric cell and determining the photographic value of light from the scene and operating the camera in accordance with such determination.

4. In the method of taking motion pictures, focusing a camera on a scene to be depicted through a certain lens, transposing said lens and focusing the scene on a photo-electric cell, determining by electrical means a reading of the light value from said scene, and regulating the iris of the camera in accordance with such determination in photographing the scene.

5. In the method of taking motion pictures, focusing a scene in a camera by a certain lens, transposing said lens to a parallel position and focusing the scene on a photo-electric cell, obtaining a graphic automatic reading by the aid of electrical apparatus indicating the light value of the scene, from a spectral value or quantitive or qualitive condition, transposing the lens to a photographic position and controlling the iris and shutter otherwise operating the camera in accordance with such light determination.

6. In making motion pictures, the method comprising the steps of determining the photographic value of a scene to be photographed by a photo-electric cell, operating a camera in accordance with such determination, recording the data of the light value and the exposure and developing a film in accordance with such determination and such record.

7. In making motion pictures, the method having the steps of focusing a scene through a lens, shifting said lens, determining the light value of the scene through the lens on a photo-electric cell, determining such light value and operating a camera accordingly, recording the data of light determination and camera operation and developing a film accordingly.

8. In the method of claim 6, in addition determining the transparency value of a negative by a photo-electric cell, and operating a printing machine in accordance with such determination.

9. In the method of claim 7, in addition transmitting light through a negative developed on to a photo-electric cell, determining electrically the value of the light transmitted and controlling the operation of a printing machine transmitting light through the negative on to a positive film in accordance with such determination.

10. In the method of making pictures, transmitting light through a negative on to a photo-electric cell, determining by electrical readings the photographic value of the light transmitted and operating a printing machine

Continued on Page 40

Quick-Set Bead Screen Latest Arrow Screen Development

The Arrow Screen Company announces that it expects to score a bullseye with its new Quick-set Bead Screen. This is the latest development of this firm and consists of a device contained in a well-finished wood cabinet which is easily and quickly adjusted to hold the bead screen taut and free from sag or wrinkles during projection. The screen support is not visible from front, and when collapsed all is in a handy carrying case. Six different sized screens are available.

The company also announces the opening of a Chicago office at 109 Wabash Avenue, with John M. Mertz in charge. The New York offices are now located at 6-8 East 46th street, with H. S. Millar in charge.

Game in the Gobi

Continued from Page 25

was only one way to bag our quarry. We must outflank them. At least never bar the path to their lair, for they stampede at the least alarm, and to be in their path would mean death. Calling my safari together by signs and signals, we drew off some distance and for the next two hours planned the attack.

There was much discussion, but I finally decided to throw all caution to the winds and bag the king of that herd or die in the attempt. Notwithstanding the entreaties of my men, I decided to go on alone, and it was with reluctant hands that they strapped on my trusty weapons.

I had determined not to be caught unprepared, so went fully armed. I went prepared for any emergency, be it an attack from a distance or a hand to hand combat, and it was well that I did, for when that stampede broke I was the subject of a thousand thrills and chills.

Retracing my steps to the hilltop, I again spotted the king of the herd and set about planning a course of action. The old master stood there proudly tossing his head in the breeze, little knowing what was in store for him. I approached the herd at right angles and selecting a large rock that offered protection from all sides I decided to lie there until the herd reached such a position that, when alarmed, they would pass me within shooting range.

Making myself comfortable I chose the weapon with which I had hoped to bring down one of these beasts. I had timed everything to a nicety and had just pulled a beautiful shaft from my quiver and drawn it taut across the bow when the herd got down wind and charged. Straight for their caverns they thundered and true to tradition the old king of the herd was bringing up the rear in protection of the weaker ones.

The Author proudly poses with the carcass of the terrible Jerboa he has slain.

The herd roared past and the old male came on nearer and nearer to his doom. I pulled up my trusty bow and arched my back in a powerful draw. Looking along the shaft I saw the herd pass and the old bull coming on. Leading him slightly I loosed a shaft well sped. A glint of the arrow and the gleam of the broadhead as it cleft the air—the old fellow stopped in his tracks, wavered a moment, and, faw down. The shaft zipped through the air a good two feet over him. Astounded, I leapt to my feet and ran to where he lay—and what do you think I found? He had stepped into a mouse trap set out by one of the natives the night before.

And so ended my hunt for the famed Jerboa.

Lighting the Home Set

An Expert on Amateur Lighting Gives Some Pertinent Advice On This Question That Means So Much To Good Picture Making.

By Val J. Roper
Engineering Department, National Lamp Works of G. E. Co.

TO THE eager new owner of the amateur movie outfit almost any pictures of the family, friends, or self, that move and are recognizable, are pleasing. His first few shots are not ordinarily planned, but are taken spontaneously of whatever subject matter presents itself. He is thrilled, and proud, to see his dear ones, or his friends in movies that he made.

After the first roll or two of film is consumed in this manner—after the "novelty has worn off"—he begins to cast about for especially interesting subject matter which, when reproduced, will not be boresome to even chance acquaintances. He begins to plan his shots and guard his footage—he has a reason for each shot. He often goes to the extent of planning home scenarios, becoming playwright, producer, and director as well as cameraman, scene shifter, electrician, editor and projectionist. It's real sport, this home movie game, teeming with interest and abounding with untold possibilities.

Val J. Roper

Many of the most interesting and most desirable shots can only be made indoors, or at night; these of course necessitate the use of artificial lighting equipment. This necessity may seem almost prohibitory at first thought, for at some time or other each of us has read about or seen pictures of the elaborate set-up of powerful lights used for illuminating the professional motion picture set. For instance, witness the pictures of the Broadway set, appearing in the March issue of the American Cinematographer. However, while the fundamental principles underlying the lighting of the large movie sets apply to the amateur set as well, the amateur's requirements are really much more modest; he will find that convenient and adequate lighting equipment is available for his use, and at no great expense.

Before going into the selection of properly designed equipment, let us consider briefly the lighting requirements. First of all, there must be enough illumination on the entire subject to sufficiently expose the negative.

The amount of this intensity varies with the lens speed, but it is hardly advisable to attempt shooting movies under artificial lighting at slower speeds than F 3.5. Just light—plain, flat light—on the subject isn't enough. The subject, and the scene, must be modelled with light—modelled to give form, life, and action. Modelling is effected through the proper placing and control of highlights and shadows. The accompanying illustration of Laocoon's head lighted three different ways (Figure No. 1) gives a picture story better than any word story of the difference between flat lighting, lighting to give desirable contrasts, and lighting to give harsh contrasts. Light is poured upon the face at the left equally from all directions—the result is very flat, with complete loss of detail. The middle head is illuminated chiefly by light coming from the upper left, but there is enough light on the darker side of the face to round out the shadows and keep them from being too harsh. In the case of the head on the right, all of the light is coming from the one side, producing very harsh shadows and again resulting in an unnatural effect and loss of detail, qualities which will on occasion be wanted to express a particular feeling. The degree of modelling attained with the middle face is that ordinarily required. Usually, then, we need directional light, and the majority of the light on the subject from one direction, but enough diffused light all over the subject to expose the negative.

In the professional studio, the diffuse illumination is known as general lighting and is obtained by directing

Left to right: 1, absence of contrasts; 2, proper contrasts; 3 Extreme contrasts.

a flood of diffused light over the entire set from a group of so-called broadside or general lighting units. These alone produce flat lighting, giving no form to the set and emphasizinfg nothing. The modelling lighting is piled on top of this general illumination—large parabolic mirror spotlights using very high wattage lamps give the light control necessary to produce contrasts, model the subjects, give emphasis to certain parts and simulate certain natural effects such as sunlight streaming through a window.

Since the home sets are naturally much smaller than the professional ones, and since it is not strictly imperative that the home movie be technically perfect, the professional types of lighting equipments are not necessary. Furthermore, they are too costly and too large physically to be conveniently handled in the home by the amateur. Amateur lighting equipment should be fairly compact, reasonably priced, convenient and safe, and it is usually necessary to limit the number of units to two or three to insure against overloading the house wiring circuits. Therefore, it is imperative that the amateur equipments be highly efficient as light producers, and in placing the light just where it is wanted. Efficiency of light utilization is even more important with the non-professional equipments than with professional. Fortunately it has been found possible, with a light source such as the higher wattage incandescent filament, to design efficient reflecting units which answer the amateur's needs. Each owner of a home movie outfit should possess at least one or two of these well designed lighting units (Figure No. 2). They may be pooled by the local movie club to provide sufficient lighting equipment for filming interior scenarios on a larger scale.

It is possible to obtain an acceptable compromise for both general and modelling illumination from one type of unit. The contour of such a reflector is so designed that it diffuses some light over a limited area, but has a "hot" spot in the center which may be directed at the part to be emphasized. The surrounding diffused spread illuminates the background, or supporting action. Then by means of reflecting screens, or a similar unit placed at a greater distance, the deep shadows produced by the "hot" spot of the unit furnishing the main directional light may be filled in to give the desirable contrasts.

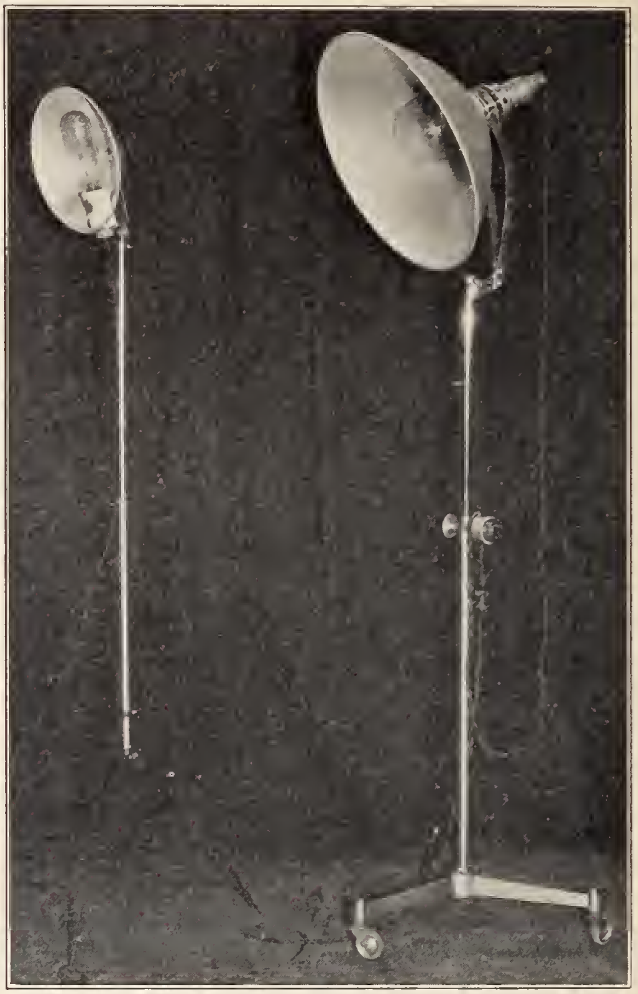


Fig. 2

Lighting units giving a wide, diffused spread of light are ordinarily not satisfactory for amateur motion picture photography. These scatter the light over too large an area, at a resulting low intensity. Fortunately, because of the smaller sets encountered in the home, the spread, or area covered by the individual reflector, may be small. Reflector design limiting the light to a narrow spread effects higher intensity of illumination over the useful areas. Such reflectors are of parabolic, or modified parabolic contour, and usually have semi-matte finished surfaces to obtain beams without striations, or streaks. However, specially designed polished surface reflectors may produce the same results, with possibility of higher efficiency.

The diameter, as well as the contour, of the reflector determines the amount of light picked up from the source and redirected to the useful areas. For a given reflector design—say a paraboloid—twice the reflector area gives, roughly, twice the candlepower. This is because each minute section of the reflector surface reflects an image of the light source; the more surface, the greater the number of reflected images, and hence the higher the candlepower. The desirability of compactness, and portability of amateur equipment limit the diameter. However, as mentioned previously, since the total wattage possible to employ on house circuits is limited, and since very high intensities of illumination (compared to the usual lighting levels in the house) are necessary, it is advisable, especially in shooting action covering, say the entire end of a room, to employ large diameter units. A word of caution here—large diameter alone does not necessarily infer high efficiency of light utilization. It is first essential that the contour be such that it redirects the light within a relatively small angle—an angle about thirty to forty degrees.

There are a number of well designed equipments on the market—Figure No. 2 shows two general types of equipments giving the proper light distribution. The smaller of the two has the feature of compactness, and with a 1000-watt projector lamp gives a maximum of about 20,000 candlepower. The larger, while it is light in weight and very portable, is not so compact, but with a 1000-watt general lighting service lamp gives about 35,000 candlepower, and with the same lamp operated about 10 per cent over-voltage (105-volt lamp on 115-volt circuit) it gives a maximum of about 50,000 candlepower.

Table I shows the minimum foot-candle intensities necessary to taking motion pictures at the normal speed for different lens speeds; the distance at which both the smaller and the larger diameter equipments illustrated in Figure No. 2 must be placed from the object or subject photographed to give this minimum foot-candle intensity; and the lighted area covered by the units at this distance. A table of this type might be used to determine the number of these units required for lighting a set of any given size. Intensities of illumination several times those shown in the table may be employed without over-exposing the film, and it is desirable to use higher intensities than those indicated, on the parts of the set, or the action, to be emphasized.

For obtaining marked highlights, contrasts, and special effects, a lens type spotlight (Figure No. 3) is to be recommended. With this it is possible to obtain either a very narrow beam of light of high intensity, or varying spreads of lower intensities. One or two of the efficient reflector units, in conjunction with a good lens spotlight using a 500 or 1000-unit incandescent spotlight lamp, gives the amateur movie photographer equipment that is ample to suit almost all of his lighting requirements.

Perhaps it would be well at this point to enter another word of caution about the danger of overloading the house wiring circuit. It will often be found that the fusing is not sufficient to carry even the safe load. Therefore, to obviate the annoyance of blowing fuses, it is best to see that a 15-ampere fuse is installed in each circuit to which the movie lighting reflectors are to be attached. Don't, by any means, short around the fuses, for these are protective devices that are absolutely necessary for insurance against fire. If more than one unit is used, each should be connected to a separate branch circuit, and if it is necesary to run an extension cord across the room or into another room, heavier wire than the ordinary lamp cord should be used—this should be No. 12 or 14 at least. A 1000-watt lamp should not be connected to a floor, bridge, or table lamp, for the wiring devices used on these are not designed to carry the comparatively heavy current taken by a lamp of this size. Of course these units are used only for very short periods of time, and hence higher currents may be safely drawn through these wiring devices than in the case of continuous operation. Another good rule to observe is to never have a high wattage appliance, or lights

Fig. 3

all over the house, in operation at the same time the movie lighting equipments are being used.

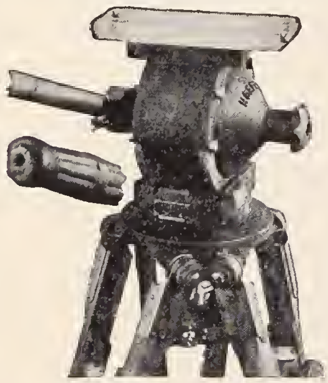
For best illumination results, it is advisable to use lamps which have a voltage rating at least five volts lower than that of the general house lighting lamps which you use. The reason for this is the fact that the heavier load of these high wattage units causes a material voltage drop in the house wiring. The voltage at the lamps when the movie lighting units are in operation may be expected to be at least five volts under the value normally encountered. Hence if the house circuit voltage is normally 115 volts, 110 or 105-volt lamps should be used.* The projector (tubular bulb) type of lamps commonly used in the compact type of amateur equipments are especially designed to give a maximum light output for their wattage; however, the general lighting service type of lamps (pear-shaped bulb) used in the larger diameter equipment, illustrated in Figure No. 2, are designed for services not requiring these high intensities and hence have a lower efficiency. For best results in making motion pictures, this type of lamp should be

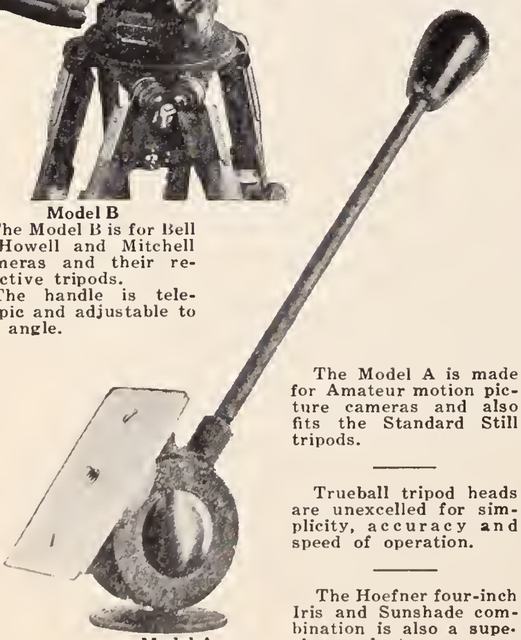
TABLE I

		Small Diameter Unit—Fig. 2 (1000-watt Projector Lamp)		Large Diameter Unit—Fig. 2 (1000Watt General Lighting Service Lamp) **100% Volts		**110% Volts	
Lens Speed	*Minimum Foot-Candle Intensity	Distance of Unit from Subject	Diameter of Useful Lighted Spot at This Distance	Distance of Unit from Subject	Diameter of Useful Lighted Spot at This Distance	Distance of Unit from Subject	Diameter of Useful Lighted Spot at This Distance
1.5	85	13′ 4″	7′ 7″	16′ 7″	10′ 5″	19′ 6″	12′ 4″
1.8	123	11′ 1″	6′ 3″	13′ 9″	8′ 8″	16′ 3″	10′ 3″
1.9	137	10′ 6″	5′ 11″	13′ 0″	8′ 3″	15′ 4″	9′ 8″
2.3	200	8′ 8″	4′ 11″	10′ 10″	6′ 10″	12′ 9″	8′ 0″
3.5	460	5′ 9″	3′ 3″	7′ 1″	4′ 6″	8′ 5″	5′ 4″

*The foot-candle is the standard unit of intensity of illumination. At noon on a bright summer day the illumination intensity measures 8,000-10,0000 foot-candles. Stores and offices have usually been considered well lighted when the intensity is 10-15 foot-candles.

**100% Volts means circuit voltage same as lamp voltage. 110% Volts means circuit voltage 10% higher than lamp voltage.





over-volted about 10 per cent. That is, the labelled voltage of the lamps should be 10 volts lower than the voltage at the sockets when the lamps are turned on.

It was stated previously that the physical properties of the incandescent lamp permit efficient reflector design. The incandescent lamp has other advantages which make it a most desirable source of illumination in taking home movies, as well as for lighting the larger sets of the professional studio. It is most convenient—may be turned off and on at will by a switch; it emits light of constant quantity and quality; it emits no chemical or ultra-violet rays, and hence the subjects cannot experience "Kleig eye." It requires no attention during operation, an important factor with the amateur. Furthermore, its use is especially desirable with panchromatic film—color reproduction is then obtained without the use of any filters. The incandescent filament emits light of all colors, and enough of a preponderance of red and yellow to counteract the lesser sensitivity of the panchromatic film to those colors. When arcs are used as the light source in connection with panchromatic film, the so-called panchromatic carbons should be employed, otherwise the advantages of the panchromatic film are nullified.

The home movie has assumed important proportions in our amusement life—it is gradually taking a place in our homes alongside of the radio. Its scope is increased tremendously when outdoor shots are supplemented by the many intimate scenes which may only be taken indoors, through the use of artificial lighting equipment.

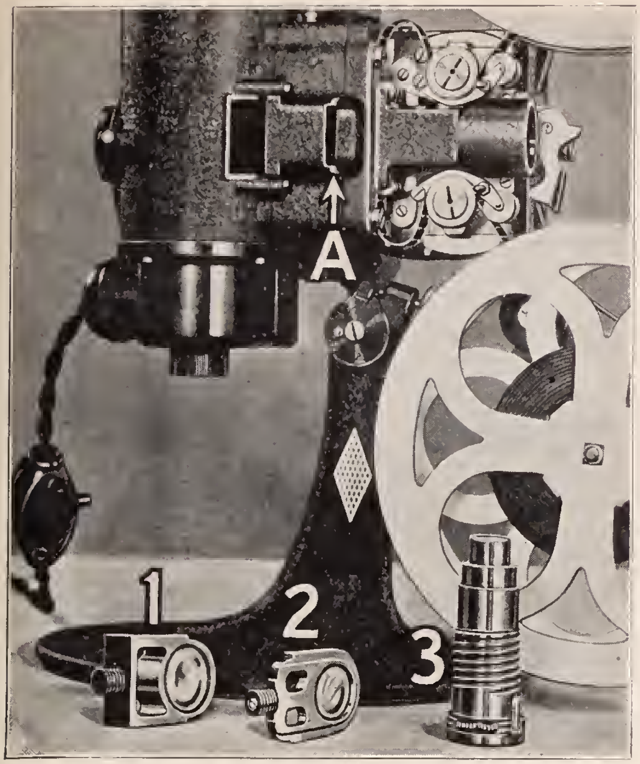
*If possible, it would be well to check the voltage at the socket with the lamps turned on, using a reliable voltmeter. A good way to check the voltage before the lamps are first obtained, is to use a high wattage appliance, such as a heater, and measure the voltage at the socket both with the heater on and off. The difference, or voltage drop, is proportional to the current drawn. Hence, if the heater consumes 660 watts, or 6 amperes, the voltage drop, were a 1000-watt lamp used in its place, would be 10/6 as much, since the 1000-watt lamp takes approximately 10 amperes. If two lamps were used on the same circuit, the voltage drop would be doubled.

Professor Baker Calls Talkies Great Invention

Motion pictures have been a great help to speech in the drama, and the "talkies" are the beginning of a great invention, Dr. George Pierce Baker, professor of drama at Yale University, told the American Academy of Arts and Letters in New York recently.

"I believe the motion picture of the last twenty years has helped speech in the drama," he said. "Now we are faced with that so-called art-form, the 'talkies' or 'speakies,' titles which in their infantile diminutives suggest their age. Here, however, is the beginning of a great invention. As yet those who are working with it admit to me that they do not fully understand its possibilities."

Dr. Baker predicted that drama in the future will be more compact and that more perfect dramatic speech will be achieved. Dramatists have been compelled to separate themselves more and more from melodrama and to turn to intimate, delicate characterization.



Filmo 57-G Projector for Kodacolor, showing (A) opening for auxiliary condenser. In foreground (1), 45-50 condenser; (2) auxiliary condenser, and (3) Kodacolor projection lens.

New Projector for Kodacolor Films Announced by Bell & Howell

A new FILMO Projector model, known as the FILMO 57-G Kodacolor Equipped Projector, has been developed by the Bell & Howell Company, and is now on the market. This machine, it is claimed, embodies a highly improved Kodacolor optical system, and provides the best obtainable results when projecting the beautiful films which may be made by the Kodacolor process.

The FILMO 57-G Projector differs from previous Kodacolor equipped FILMO models in that it has a new special Kodacolor projection lens assembly and an auxiliary condenser. The new lens attains the ultimate degree of color correction for Kodacolor. The auxiliary condenser is located between the regular condenser and the projection lens. Its purpose is to direct the light rays through the Kodacolor film at the same angle at which they meet the film in the camera. This is a highly important part of the optical system, as the tiny lenses on the Kodacolor film can properly play their part in projection only when the photographing optical conditions are accurately reproduced in the projecting optical system.

The FILMO 57-G Projector, in addition to being equipped with the new Kodacolor lens assembly and auxiliary condenser, has the 250-Watt, 5-ampere lamp, 45-50 condenser, and the variable voltage resistence and voltmeter units, thus providing powerful illumination which contributes materially to the beauty of Kodacolor pictures. The regular 2-inch lens and a dummy auxiliary condenser, completing the 57-G Projector for black and white work, are also included.

Previously purchased FILMO Projectors, according to information received from the manufacturer, may be equipped with the new Kodacolor projection lens assembly merely by inserting this assembly in place of the regular lens. To have the auxiliary condenser installed, previously purchased machines must be sent to the Bell & Howell factory. It is advised that this be done, because the new combination provides the ideal optical system for Kodacolor projection. However, FILMO Projector owners who do not wish to have their machines adapted for the new auxiliary condenser can use the former FILMO Kodacolor projection lens assembly.

JUGO SLAVIA

The greatest competitors of the American feature pictures are the films now being produced by the U.F.A. Company, the activities of which cover a great range of subjects. It is believed that during 1929 American films will have quite extensive competition from the U.F.A. films.

Predicts Cino-Spectrometer Will Eliminate Errors

Continued from Page 33

transmitting light through the negative on to a positive to print a positive.

11. In the method of making motion pictures, transmitting light through a moving negative on to a photo-electric cell, determining by electrical factors the photographic light value transmitted and regulating a printing machine having a source of light transmitted through the negative on to a moving positive to obtain a positive film.

12. In the method of claim 11, in which the voltage of the lamp is regulated in accordance with the determination of the light value.

13. In the method of making and using motion pictures, comprising utilizing a photo-electric cell to determine the light value of a scene to be photographed, operating a camera in accordance with such determination, developing a negative, transmitting light through the negative on to a photo-electric cell, determining the photographic value of the light transmitted, operating a printing machine in accordance with such latter determination, utilizing a photo-electric cell to obtain the transmission value of a positive and establishing data of the value of the projected light and screen to be used in projecting the picture.

14. In the method of claim 13, in addition by means of a photo-electric cell obtaining the photographic value of a projector lamp to be used in projecting through a positive.

15. In the method of claim 13, transmitting reflected light from a projector on a screen on a photo-electric cell and determining the photographic value of the projected and reflected light.

16. In the method of claim 13, in addition projecting light from a projector lamp through a positive on to a screen, transmitting the reflected light from the screen on a photo-electric cell, determining the value of such light and regulating the projector lamp in accordance with such determination.

17. A step in the method of projecting pictures, comprising projecting a light on a screen, focusing through lenses some of the light from the screen on a photo-electric cell and by electrical factors obtaining a determination of the reflected light in accordance with changes in the projecting lamp and the screen.

18. In a cino-spectrometer, a lens, a photo-electric cell focusing light on the cell, sources of electric power for the cell and for amplifying the current therefrom and a recording instrument to record the electrical values from which may be interpreted the light values on the cell.

19. In a cino-spectrometer, a camera having a lens, a photo-electric cell amounted on the camera, positioned to receive light through the said lens, sources of electric power for the cell and for amplification of the current therethrough, and means to record such electric current.

20. In a cine-spectrometer, a camera having a transposable lens adapted in one position to photograph on a film, a photo-electric cell positioned to receive focused light through the lens in another position, sources of

electric power for the cell and for amplifying the current therethrough, and means to register the current through the cell.

21. In a cino-spectrometer, a camera having a rotatable turret mounted on a magazine with a plurality of lenses, said lenses being adapted to photograph on a film in the magazine, a photo-electric cell positioned adjacent the magazine and adapted to receive light focused through any of the lenses, sources of electric power for the cell and an amplified current therethrough, and means to register the said current.

22. In a cino-spectrometer as claimed in claim 21, in which the means to register the current comprises an automatic recording thereof.

23. In a photographic printing machine having a source of light, means for projecting said light through a negative on to a positive, a cino-spectrometer having a photo-electric cell positioned to receive light through the negative, sources of power for the cell and for amplified current therethrough, and means to register said current.

24. In a photographic printing machine having a projecting lamp and means for moving a negative and positive film to be printed with the light projecting through the negative on to the positive, a cino-spectrometer having a photo-electric cell positioned to receive light through the negative sources of electric power for the cell and for the amplified current therethrough, and means to register the said current.

25. A method in the art described, comprising the step of passing light through a film, receiving said light on a photo-electric surface and controlling light values in an auxiliary step in accordance with the indication of the electric current effected by such light through the film on the photo-electric surface.

Complete Sound Stages

Frank Dexter, technical director for Darmour-RKO, has completed the erection and sound proofing of the company's talkie stages at the Hollywood studio.

Characteristics of Motion Picture Studio Light Sources

Continued from Page 15

brightness. A proper combination of the neon and mercury vapor lights should therefore produce a much better rendition of colored objects than either one of the two separately.

10. **One 50-inch mercury vapor U-tube in white enameled reflector.**
11. **Three mercury vapor U-tubes plus one neon tube.**
12. **Two mercury vapor U-tubes plus one neon tube.**
13. **One mercury vapor U-tube plus one neon tube.**
14. **One neon tube.**
15. **One straight 50-inch mercury vapor tube in standard reflector.**

Incandescent tungsten lamps. The units used were 3000-watt (115-volt) gas-filled lamps manufactured by the Edison Lamp Works, Harrison, N. J. The flood light units referred to below consisted of the polygonal mirror reflectors previously described,[5] equipped with these 3000-watt Mazda lamps. These units were operated at voltages varying from 70 to 128. The data relative to the luminous efficiency were obtained largely from a publication by Luckiesh, Holladay, and Taylor.[6] From the values of photographic efficiency obtained it was possible to plot a curve showing the relation between photographic efficiency and color temperature. This makes it possible to determine the photographic efficiency for a tungsten lamp operating at any specified color temperature.

16. **3000-watt tungsten lamp at 70 volts.**
17. **3000-watt tungsten lamp at 90 volts.**
18. **3000-watt tungsten lamp at 105 volts.**
19. **3000-watt tungsten lamp at 110 volts.**
20. **3000-watt tungsten lamp at 115 volts.**
21. **3000-watt tungsten lamp at 128 volts.**
22. **900-watt motion picture projection lamp.**
23. **10,000-watt tungsten spot light.** This unit consisted of a 10-kw. tungsten lamp of the ribbon filament type mounted in front of the 30-inch parabolic reflector made by the Bausch & Lomb Optical Company. A photograph of this unit is shown in Fig. 3.
24. **2000-watt tungsten spot light.** This unit is indentical with 23, except that the 10-kw. lamp is replaced by a 2000-watt (110-volt) monoplane filament tungsten lamp.

Experimental Results

The experimental results obtained are shown in Tables II and II-A. In Table II are all of the data relating to the various forms of arc lamps and gaseous conductor lamps. In the first section are tabulated the values of **line current** and **line voltage,** from which are computed the values of the **total wattage** appearing in the second section of the table under the general title "Total." The values of total lumens shown in this table for the flame arcs were kindly furnished by Mr. Downes of the National Carbon Company. By dividing the total lumens by total watts the over-all efficiency of the unit as a light generating device is obtained. These are shown in the column "L/W." It is obvious that all of the luminous flux generated can not be used effectively in illuminating the set. The amount used will depend on many factors, such as the shape and reflecting power of the arc housing. In the section of the table under the general title "Effective" are tabulated values which represent approximately the useful light flux obtainable from the Creco broadside unit when trimmed with the various flame carbons. It is quite impossible to make any rigorous determination of this value owing to the varied conditions existing in the studio. It seems reasonable to consider that the total luminous flux leaving the unit within a cone having a half angle of 60° represents a fair assumption of average practical utility. Therefore, measurements were made of the total luminous flux emitted within this solid angle, and from these the values of effective luminous efficiency (L/W) were computed. In the last section of the table under the general heading "Photic Efficiency" are shown the results of the photographic measurements. For convenience these are given in somewhat different forms. The symbols used as column headings may be defined as follows:

E_m is the value of exposure incident on the photographic material (expressed in foot candle seconds) which, when the material is developed to normal contrast ($_v$=0.8), will give a density which lies on the characteristic curve of the material at the point where the slope of this characteristic curve has a value of 0.2. As stated previously, it is assumed that this slope represents the minimum useful gradient. Hence the value of E_m represents the minimum exposure which is useful in the rendition of shadow detail, and from the magnitude of E_m it is possible to compute the brightness of the darkest portion in the set

Table II

No.	Source	Line Amps.	Line Volts	Arc Volts	Watts	Total Lumens	Total L/W	Effective Lumens	Effective L/W	Photic Efficiency E_m	Photic Efficiency E_x	Photic Efficiency U_v
1	Sunlight	--	--	--	--	--	--	--	--	0.004	50	100%
2	White Flame	38	110	78	4070	150,000	38	45,000	12	.009	115	43
3	Pearl Flame	38	110	76	4070	220,000	54	66,000	16	.011	140	36
4	Yellow Flame	38	110	78	4070	250,000	61	75,000	18	.015	190	26
5	Orange Flame	40	110	72	4400	190,000	43	57,000	13	.014	175	29
6	Red Flame	44	110	72	4840	120,000	25	36,000	8	.008	118	46
7	High Intensity	78	110	60	8600	--	--	25,800	3	.005	60	83
8	High Intensity	150	110	80	16500	--	--	209,000	13	.005	60	83
9	Low Intensity	83	110	65	9100		--	18,200	2	.008	100	50
10	1 Hg.	5.4	110	--	510*	--	17.9	4,600	9.0	.012	150	33
11	3 Hg. + 1 Ne.	23.3	110	--	2180*	--	--	16,300	7.5	.016	210	24
12	2 Hg. + 1 Ne.	17.9	110	--	1670*	0-	--	11,800	7.0	.022	280	20
13	1 Hg. + 1 Ne.	12.5	110	--	1160*	--	--	7,130	6.1	.026	335	15
14	1 Ne.	7.1	110	--	660*	--	--	2,180	3.3	.033	425	12
15	1 Hg.	3.8	110	--	430	7,700	17.9	3,100	7.2	.012	150	33

* Power Factor 0.85

which will give sufficient exposure for the rendition of shadow detail in that darkest portion.

E_x is computed directly from E_m and is intended to give a more definite idea of the illumination required when using the various light sources. The values shown in this column are those of the illumination on a black object, having a reflecting power of 2 per cent, required to render this black object at a point on the characteristic curve where its slope is 0.2, when photographed by means of a lens operating at f/2.3, at standard taking speed of 16 pictures per second and with the motion picture camera shutter set at an angular opening of 170°.

U_v designates the **relative photographic efficiency.** These values are computed assuming an efficiency of 100 per cent for mean noon sunlight. It should be kept in mind that these values are expressed in terms of visual units and are proportional to the photographic effect resulting from the action of equal exposures (foot-candle seconds) to light from the different sources.

The high intensity arc shown as No. 7 in **Table II** is a spot light unit using a condenser lens as a means of concentrating the light flux on the object. The low value of effective luminous efficiency, that is 3 lumens per watt, is due to the relatively low light-gathering power of the optical system. There is little doubt that a spot light using the high intensity arc could be constructed which would give much higher effective luminous efficiencies. This end could probably be accomplished by a suitable combination of mirrors and lenses similar to those used in the high intensity motion picture projector arc.

Unit No. 8 is the high intensity "sun arc" which is used for flood light purposes combining a high intensity arc mechanism with a parabolic reflector. The values of electrical and luminous efficiencies were not determined in this laboratory but were taken from a publication by Mr. Benford (**loc. cit.**). With respect to photographic efficiency, in terms of visual units, the light emitted by this unit is equivalent to that of the high intensity spot shown as unit No. 7.

Unit No. 9 is the ordinary form of low intensity arc spot. Here again the low luminous efficiency is due to the optical system used in concentrating the light beam.

Units 10 to 14 include the gaseous conductor lamps which were studied in this laboratory. Since no integrating sphere of sufficient dimensions was available, it was impossible to determine their total luminous efficiencies. Their effective luminous efficiencies, however, are based upon the radiations emitted within a cone having a half angle of 60° and are thus comparable with the other effective luminous efficiency values computed in a similar manner. It will be noted that the mercury vapor source alone has a relatively high luminous efficiency, while the neon by itself is relatively low, being only 2.8 lumens per watt available within the 120° solid angle. The photographic efficiencies, U_v, as measured on panchromatic film follow in general the same arrangement.

In case of the unit designated as 15 in the table the values are taken directly from data published relative to the standard 50-inch mercury vapor tube mounted in the reflector quite universally used in motion picture studios.[7]

In Table II-A are shown the data relative to incandescent tungsten lamps. Items 16 to 21, inclusive, refer to a 3000-watt, gas-filled lamp mounted in the polyhedral mirror reflector previously described.[5] In the column designated as "T_c" are shown the values of color temperature for the lamp operated at the indicated voltages. The reflector referred to was designed specifically for flood lighting, but the reflected luminous flux is confined almost entirely within a cone having a half angle of 45°. The values of effective luminous efficiency are computed for a spread of this magnitude. The results are therefore not quite comparable with those shown for the arcs and gaseous conductor lamps, the illumination in the case of the tungsten lamp in its reflector being confined to a somewhat narrower angle. Values in the section designated as **photic efficiencies** show the way in which this factor increases as the lamp is operated at higher and higher temperatures.

The 3000-watt lamp referred to above is not designated for operating at temperatures exceeding 3100°K (color temperature). In order to show that some increase in photographic efficiency can be obtained by raising the temperature still higher the data for unit No. 22 are given. This is the 900-watt monoplane filament lamp designated for motion picture projection service. This operates at a color temperature of 3220°K, and as shown in the last section of the table, its photic efficiency is somewhat higher. No values for the effective efficiency of this unit have been determined.

The spot light unit No. 23 has an effective luminous efficiency of 7.5 lumens per watt. Its photic efficiency of course is the same as any tungsten lamp operating at the same color temperature. The 2000-watt monoplane filament lamp used with the same reflector gives a somewhat higher effective luminous efficiency, this being due to the smaller actual size of the filament assembly. These measurements of effective luminous efficiency were made with an adjustment of the lamp giving an illuminated spot 3½ feet in diameter.

Efficiency for Rendition of Colored Objects

The data thus far given (Tables II and II-A) refer entirely to the photographic efficiency of the source under conditions where the light is unmodified by selective absorption. While this factor is of considerable interest in studio technique, it is probably of minor importance as compared with the quality factor, since the correct rendition of colored objects on the tonal scale depends upon the spectral composition and not upon actual intensity. In order to obtain some information regarding the relative characteristics of various light sources of the correct orthochromatic reproduction of colored objects, a series of color panels was photographed along with the gray scale chart already described. The method of preparing these color panels has been described in a previous communication.[8] The method followed for the determination of photographic reflecting power is identical

Table 2a

No.	Source	Line Amps	Line Volts	T_c	Total			Effective		Photic Efficiency		
					Watts	Lumens	L/W	Lumens	L/W	E_m	E_x	U_v
16	Tungsten	19.2	70	2450	1350	10,800	8	6,050	4.5	0.036	460	10.9%
17	"	22.3	90	2680	2000	26,000	13	14,500	7.3	0.033	425	11.8
18	"	24.6	105	2850	2580	45,000	17.5	25,200	9.8	0.031	400	12.5
19	"	25.4	110	2900	2800	55,000	19.5	30,700	10.9	0.030	388	12.9
20	"	26.1	115	2950	3000	63,000	21.0	35,200	11.8	0.029	382	13.1
21	"	27.8	128	3100	3560	89,000	25.0	49,800	14.	0.028	365	13.7
22	"	30.	30	3220	900	2,350	26.2	--	--	0.027	350	14.3
23	"	91.	110	3175	10000	255,000	25.5	75,000	7.5	0.028	365	13.7
24	"	18.	110	3100	2000	50,000	25.0	16,500	8.3	0.028	365	13.7

Table 3

No.	Color	Visual R_v	Photographic Reflecting Power Hg.	3-1	2-1	1-1	Ne.	Tungsten
71	Spectrum Red	8.0	1.5	3.0	7.8	14.0	35.0	20.0
72	Vermillion	14.0	5.2	6.5	12.0	19.0	24.0	22.0
59	Vermillion Orange	22.0	6.0	8.5	14.0	29.0	43.0	28.0
58	Cadmium Orange	23.0	6.5	7.8	16.0	25.0	46.0	25.0
49	Cadmium Yellow	36.0	8.5	11.0	21.0	29.0	54.0	30.0
51	Spectrum Yellow	40.0	8.0	10.0	14.0	28.0	43.0	31.0
19	Chrome Yellow DO	23.0	7.0	7.8	15.0	25.0	35.0	26.0
18	Chrome Yellow Orange	31.0	9.0	9.8	19.0	31.0	48.0	30.0
16T	Chrome Yellow Lemon,50	51.0	13.0	16.0	22.0	35.0	48.0	36.0
107	Apple Green	38.0	12.0	14.0	17.0	29.0	35.0	26.0
109	Emarald Creen	31.0	12.0	13.0	15.0	15.0	16.0	23.0
61	Cobalt Green	17.0	11.0	9.0	12.0	13.0	10.0	16.0
60J	Viridian, 50	16.0	20.0	18.0	14.0	13.0	12.0	14.0
80W	Cobalt Blue, 25	24.0	50.0	45.0	38.0	30.0	20.0	40.0
82E	Prussian Blue, 25	9.0	18.0	17.0	16.0	15.0	15.0	13.0
83G	French Ultramarine,50	11.0	34.0	32.0	39.0	25.0	12.0	22.0
30	Ultramarine Blua	6.0	18.0	17.0	14.0	10.0	5.0	14.0
64	Cobalt Violet	9.0	32.0	26.0	30.0	32.0	30.0	26.0
658	Spectrum Violet,12.5	8.5	20.0	18.0	22.0	20.0	18.0	14.0
95L	Purple Laka, 50	8.0	14.0	12.0	16.0	14.0	16.0	13.0
96	Magenta Laka	4.8	7.5	6.8	7.0	8.7	7.2	5.0
73A	Permanent Crimson,50	6.8	10.0	11.0	13.0	16.0	30.0	12.0

with that described in the communication just mentioned. The color panels were photographed under the same conditions as those used in making the pictures of the gray panels. The exposed film was given exactly the same development treatment and densities were read in the usual manner. The method of obtaining the photographic reflecting power may be illustrated by reference to Fig. 1. The density obtained from an image of one of the color samples is laid off on the density scale, for instance at point B. A horizontal line through this point cuts the characteristic curve which is established from the readings made on the gray chart at the point O. A perpendicular dropped from the point O to the log exposure axis determines the point C. From this value the photographic reflecting power of the color panel in question can be computed directly. The results of this work are shown in Tables III and III-A. The colors are arranged from the top downward, beginning with red and running through the spectrum to the blue. It should be remembered of course that the pigments used reflect relatively broad spectral bands and hence the arrangement shown while representing in general a systematic progression of wave-length from red to blue, can only be considered as approximating a true spectral progression.

In Table III are given the values obtained with the gaseous conductor lamps and incandescent tungsten. The values in the column designated as "visual" are the reflecting powers of the various color panels as determined under sunlight illumination. The column headings under the general title "Photographic Reflecting Power" have the following meaning:

Hg Cooper Hewitt mercury vapor lamp.
3-1 Three mercury vapor units plus one neon unit.
2-1 Two mercury vapor units plus one neon unit.
1-1 One mercury vapor unit plus one neon unit.
Ne One neon unit.

Tungsten 3000-watt Mazda lamp operating at color temperature of 3100°K.

It will be noted that the mercury vapor gives relatively low values for the red colors and very high values for the blue end of the spectrum. It appears that the combination of the two mercury vapor tubes with one neon tube is the optimum combination from the standpoint of correct rendering of tone values. The neon unit alone gives reflecting power values for the red panels which are much higher than they should be. The tungsten illumination tends to give values somewhat too high for the red panels, but gives fairly correct orthochromatic reproduction for all others.

In Table III-A are given the results obtained with the various types of arc units, the column designations having the following meaning:

HI High intensity arc.
LI Low intensity arc.
WF White flame arc.
YF Yellow flame arc.
OF Orange flame arc.
RF Red flame arc.

It will be noted that the reflecting power values obtained with the high intensity arc are too high at the blue end of the spectrum and too low at the red end. Some improvement is obtained by using the low intensity arc, and even better results with the white flame arc.

Table 3a

No.	Color	Visual R_v	Photographic Reflecting Power H.I.	L.I.	W.F.	Y.F.	O.F.	R.F.
71	Spectrum Red	8.0	3.5	4.0	4.5	7.8	12.0	16.0
72	Vermillion	14.0	7.5	12.0	12.0	14.0	18.0	22.0
59	Vermillion Orange	22.0	11.0	12.0	13.0	17.0	25.0	30.0
58	Cadmium Orange	23.0	8.5	13.0	12.0	17.0	23.0	28.0
49	Cadmium Yellow	36.0	12.0	16.0	15.0	19.0	25.0	30.0
51	Spectrum Yellow	40.0	9.5	10.0	13.0	16.0	23.0	28.0
19	Chrome Yellow DO	23.0	10.0	13.0	12.0	14.0	21.0	25.0
18	Chrome Yellow Orange	31.0	14.0	18.0	18.0	20.0	26.0	30.0
16T	Chrome Yellow Lemon,50	51.0	12.0	18.0	20.0	20.0	29.0	30.0
107	Apple Green	38.0	15.0	19.0	16.0	19.0	24.0	26.0
109	Emerald Green	31.0	15.0	12.0	18.0	17.0	18.0	16.0
61	Cobalt Green	17.0	12.0	10.0	13.0	12.0	12.0	11.0
60J	Viridian, 50	16.0	20.0	13.0	15.0	14.0	15.0	11.0
80W	Cobalt Blue, 25	24.0	50.0	38.0	45.0	39.0	40.0	35.0
82E	Prussian Blue, 25	9.0	18.0	15.0	16.0	13.0	15.0	14.0
83G	French Ultramarine,50	11.0	32.0	25.0	28.0	24.0	25.0	23.0
30	Ultramarine Blue	6.0	20.0	16.0	18.0	18.0	16.0	15.0
64	Cobalt Violet	9.0	34.0	30.0	28.0	27.0	29.0	29.0
658	Spectrum Violet,12.5	8.5	18.0	17.0	17.0	14.0	15.0	16.0
95L	Purple Lake,50	8.0	13.0	12.0	14.0	12.0	13.0	15.0
96	Magenta Lake	4.8	6.5	4.4	4.0	4.5	6.2	6.2
73A	Permanent Crimson,50	6.8	8.2	7.9	6.0	7.8	10.0	14.0

The orange flame gives very good correction in general, although there is a tendency for the red panels to show a reflecting power higher than their visual values. The red flame arc produces considerable over-correction at the red end.

3. J. O. S. A. & R. S. I. **6**: 549, (1922).

4. Trans. Soc. Mot. Pict. Eng. **24**: 82, (1925).

5. **Incandescent Tungsten Lamp Installation for Illuminating Color Motion Picture Studio.** Loyd A. Jones. Trans. Soc. Mot. Pict. Eng. **22**: 25, (1925).

6. **The Short-Wave Radiation from Tungsten Filaments.** Luckiesh, Holladay, and Taylor. J. Frank. Inst. **196**; 353, 495, (1923).

7. **The Cooper Hewitt Mercury Vapor Lamp.** L. J. Buttolph. Gen. Elec. Rev. **23**: 741, (1920).

8. **The Photographic Reflecting Power of Colored Objects.** L. A. Jones. Trans. Soc. Mot. Pict. Eng. No. 31: 564, (1927).

RUSSIA

The Moscow factory of Svokino has opened a special branch where Proletarian authors are taught the science of scenario writing by highly qualified specialists. Twenty-five authors are now being trained, most of them drawing wages from the Svokino.

Limitations of the Iron Ear

Continued from Page 12

how action before his camera must be kept within certain limited areas. The shape of the critical area around a microphone, however, is circular, with the back area, approximately two thirds of the circle, good only for limited frequency bands. That is, the area behind the microphone.

The circle is made larger, up to the limits of the sensitivity of the device, by turning a dial on the control panel. Likewise, it is made smaller. Microphones vary. Very good ones will pick up orchestral sounds within a circle thirty feet in diameter, under what might be termed normal degrees of sensitivity. It has been the writer's experience that sensitivity should, as far as possible, remain constant throughout a pickup. Performers, then become microphone conscious, and are able to adjust their audio performances to their limitations of the sound equipment.

Reflecting substances, such as glass, metals, hard woods, etc., also have an effect upon the critical area of the pickup device. Effects can be secured by placing small reflecting shields behind certain sources of sound, to give them greater intensity on the diaphragm of the condenser microphone. But this is an art as yet little understood.

What do we mean by sounds being too high or too low? The range of the human ear—the average human ear—is much wider than any recording mechanism yet made. The best recording machines will take sounds from sixteen to eighty-two hundred cycles. Under present conditions, in the writer's opinion, sounds should be confined to the band from about twenty to six thousand cycles. The bottom of the orchestra, for example, should not be lower than the tone of the A string on the contra bass. The matter of overtone scales, which give quality, will not be gone into here, as space is limited. Fair music and voice quality can be had between the frequency bands given.

Now for the fourth named limitation, that of **all** sounds being picked up within the critical area. Again the cinematographer is reminded of his camera. The microphone hears everything, frankly, without discrimination—if it is a good instrument.

Here is one of the factors to deal with, difficult to understand, because the human ear is so different. The human ear hears what it **wants** to hear, and leaves out what it does not want to hear. It compensates. No choice is left the user of sound equipment, then, but to eliminate sounds he does not want reproduced, all of which is very hard to do. If he builds sound-proof walls around his microphone, they will reflect, and the microphone will pick up sound on the rebound. If the walls are covered with sound absorbing materials to prevent reflection some of the frequencies will be more readily absorbed than others. If a human body moves within the critical area, or not far beyond it, as much sound will be absorbed as would escape through four and a half square feet of open window.

And finally, there must grow up on the lot sincere respect for the iron ear. It is not a toy. It is highly sensitive and rather delicate. It should be treated with reasonable consideration due to its inherent weaknesses. "Lay off mike," ought to be firmly impressed in everyone's mind.

In order best to keep sounds within the limitations of the iron ear, trained personnel is necessary, men and women who are ear-minded, who have been more or less educated through their ears.

Well educated musicians, as a rule, have these basic qualifications. But unfortunately many of them **refuse** to recognize the natural limitations of the iron ear.

It is no more ridiculous to require a camera tripod to walk from place to place than it is to expect the iron ear, the amplifier, recording machine, and reproducer, to do things they are not designed to do.

No A. B. C. of Sound This Issue

Our Technical Editor journeyed to New York to cover the S. M. P. E. Spring Meeting. As a result he has not had the time to prepare his fourth installment of his noted series of A. B. C. of Sound articles for this issue. However, the July issue will contain it, and we hope there will be no more breaks in this interesting series.—[The Editor.]

GERMANY

The German press announces the coming formation of an International Talking Picture Theater Association, which will have representative units in London, Paris, Berlin, Vienna, Warsaw, Zurich and Rome. It is stated that the necessary steps have been taken to bring about a much closer co-operation with America.

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FOR SALE—Wilart Professional camera, less than two thousand feet of film run through; 400-ft. magazines, outside type, turret on front with F 2.7. Carl Zeiss and F 5 Wollensak lens. Inside masks, magnifying focusing direct on film, level direct vision finder, camera adapted for trick crank; Herbert & Huesgen tripod. Price, $200. J. E. Kilts, 695 Washington Ave., Albany, N. Y.

FOR SALE—MISCELLANEOUS

FOR SALE—Acme S.V.E. portable moving picture projector in perfect condition. Complete with gold glass shutter. Stereopticon attachments; extra 1000-watt lamp and cover. Dunn, 6074½ Selma; Phone, GL-3044.

FOR SALE—Mitchell Matte Cutter. 75 M. M. Astro Lens F 1.8, Graff Variable Focus Lens. J. R. Lockwood, 1108 N. Lillian Way. GRanite 3177.

FOR SALE—Four 400 Ft. Mitchell Magazines with case. J. R. Lockwood, 1108 N. Lillian Way. GRanite 3177.

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FOR SALE—16 mm optical reduction printer in perfect working and mechanical condition at a sacrifice price delivered to your address freight prepaid, cost $2000. Will sell for $950 cash. Write for details, RAY-BELL FILMS, 817 University Ave., St. Paul, Minn.

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FOREIGN REPRESENTATIVES

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Riders of the Skies!

No, these men are not hurlers of death-dealing bombs. They are just cinematographers as they appear in action while "shooting" motion picture aerial thrillers. Lower right (full length) is Harry Perry, A. S. C., about to start for the heavens while making "Hell's Angels."

The other two pictures above are of Elmer Dyer, A. S. C., in aerial action and in repose. Inset shows Harry Perry and one of his aerial crews shot while "Hell's Angels" was being made. Standing, left to right: Billy Tuers, Elmer Dyer, Harry Perry and the late E. Burton Steene.

All in the Day's Work

Whenever A Thrilling Air Scene Flashes Across the Screen—Remember, A Cameraman Was Up There, Too—Always Right "On the Tail" of the Actor's Plane. But, They Are Modest Men

By Loretta K. Dean

[This is the first of a series of articles about A. S. C. members who have been meeting romance, excitement and adventure in all climes while going about their daily task of photographing the stars. How Dan Clark, A. S. C., shot an under-water picture in a home-made diving bell will be a high spot in next month's article.—Editor's Note.]

"NO MATTER what happens keep on the tail of that plane all the time. If it crashes I want the crash. Stay with it all the way." The speaker was a motion picture producer talking to his cameraman who was about to take the air. He meant business. The cameraman didn't even smile. Just nodded his head and climbed aboard the camera plane.

A half hour later the plane he had been told to follow had crashed to the ground. Only a burning mass of wreckage was left from which was fished the dead remains of a man who had been keeping smoke pouring from the plane. The pilot had jumped. But the smoke maker had stayed to the end—either because he did not hear the warning of the pilot, or for some reason that will never be known.

And—as the plane dropped like a plummet from the sky it was followed by a cameraman, a member of the A. S. C., who "got" every foot of it from the start to the unforeseen and tragic end. That cameraman was E. Burton Steene, who died less than a week later. Died from heart trouble. Whether or not his heart had been affected by the many, many wild flights he had made in his years of photographing in the air is something no one will ever know. But, the fact remains, he "got" his picture. Always got them. Always followed through. That is a way cameramen have.

We often read the startling stories of the feats of the actors and their "stunt doubles" in the air. We thrill at the narrow escapes they have experienced. We drop into our favorite theatre and sit with mouth agape watching the latest air picture and our blood runs cold as we see the star go through the death-defying stunts.

But—how many of us ever stop to realize that a cameraman was "on the tail" of each spectacular stunt we see on the screen. Riding like a mad man standing up in the plane with his body often twisted in weird shapes as he swings his Akeley about to keep the plane of the actor in his line of vision!

And always with the command of the director and producer ringing in his ears: "Follow that ship no matter what happens—we want it—"

Modest men are these cameramen of the air. Ask them about the thrills and they start telling you about the difficulties of getting the right filters for terial work where their altitude is changed so swiftly that they run into different light conditions in the twinkle of an eye.

Take Elmer Dyer, for instance. I tried to get him to tell me about his thrills. Elmer is one of the outstanding photographers of the air.

"Well," said Elmer, "sometimes it's tough up there. You see we get all set for the light conditions at five thousand feet. Then a bird gets his ship all twisted up and starts for the ground hell bent and we have to follow him, windering if he is in a stunt or a real fall that will be a smash. First thing you know the darned light has changed so much that you don't know whether you will get a good picture or not. And on the ground the producer is yelling for perfect shots. . ."

"Yes," I broke in, "But what about the thrills?"

"Oh yes," resumed Dyer, "that's so. Well, I have worked out a filter idea that makes me happy, for I know I'll get good pictures as long as I can keep a bead on the ship I'm after. I wouldn't tell you the secret of those filters for anything. But we can go through all kinds of air and light conditions and still have pictures that are what the producers want."

Try and get him to talk on the thrills and hazards!

"Oh, yes," suddenly exclaimed Dyer, "I remember one."

Imagine a man forgetting an airplane thrill!

"It was away back in 1925. I was flying in a plane with Dick Grace as pilot. Things were going great and I was tickled pink with the results we were getting. Dick and I had talked it over on the ground and we had planned our work all out. Everything was going great. We had signals all arranged and we were working together like a charm.

"Then came a shot that was to be a whiz bang! Grace was to suddenly go into a falling leaf so we could get a particular effect. I had one camera strapped to each side of the cockpit and when we were to go into the leaf he was to signal me and I was to fasten my belt on and hop to the other camera and signal him back.

Alvin Knechtel, at camera, and Col. Arthur Goebel, famous trans-Pacific and trans-continental flyer, about to go aloft to "shoot" a picture.

"He signalled all right. I guess I must have gotten my signals all balled up for I gave him the wrong one and he went into that leaf while I was crossing to the other camera without my belt on me. The ship lurched and I started head-first out of the plane. I thought for a second I was surely gone. But I grabbed onto that camera and hung on for dear life.

"The ship gave another lurch and what he went into then I never did know, for I lost my grip on the camera and dropped down into the cockpit so hard I was partly stunned. Well, it's all in the game, but I didn't enjoy that little episode at all." And Dyer leaned back and laughed heartily as he thought of how narrowly he had escaped death while doing the everyday duities of a cameraman in the air.

Funny fellows these cameramen. Absolutely fearless. And then, some producers kick like steers when the cameraman demands extra pay for going into the air. Who wouldn't ask it, Mr. Officer?

Dyer has been a flying cameraman since 1918 when he flew with the great Locklear. Steene flew with Locklear also. And Dyer has never been hurt yet. But he has photographed the aerial scenes of "The Winged Horseman," "The Great Air Robbery," "The Big Hop," "The Air Circus," and did a lot of work on "Hell's Angels," as well as the air work on "Flight."

All that happened to him in "The Winged Horseman" was that his face and hands were frozen while in the air on one sequence. But, like all cameramen, he makes light of that.

"I guess this áir stuff is a bit dangerous," finally agreed Dyer, "and probably if the producers had to do the flying they wouldn't kick about paying extra for our work.

"Only once did I ever have the big boss with me," continued Dyer, "and that was a funny one. I was going to shoot some stuff over the site of the coming Boulder Dam for a man who wanted the shots for commercial purposes. We took off from Needles and flew about our business. It was a nice day and we did a lot of work. But we got a late start in the afternoon.

"Darkness suddenly started falling fast and we turned and headed for home. But you know how darkness falls when it starts. Well, we did some plain and fancy flying in the dark and finally sighted Needles in the distance. I admit I was a bit nervous, for I wondered how the pilot was going to land. The big boss was along and he was wriggling all over the place. But he kept quiet.

"Finally the pilot circled Needles several times and then started down. For the life of me I couldn't tell where he was heading, for there were no floodlights and fine landing fields in those days. But, I thought, 'Here goes nothing' as we started for the ground. I looked over the edge of the plane and could see nothing but what looked like a lot of white spots toward which we were landing.

"A few moments later we landed, beautifully. And then I found out what the white spots were. They were tombstones. You see, the pilot had recalled that there was a nice flat field by the side of a cemetery at Needles. He spotted the white tombstones and, guided by them, hit the right field and we all breathed safely again. I wonder what would have happened if he had misjudged, or if some of the tombstones had been of that dark slate."

Harry Perry is another air expert. For nearly two years he has been chief cinematographer, directing the photographic end of Howard Hughes' great air spectacle, "Hell's Angels." During that time he has had as many as twenty-three camera mounts for air work. But to talk with him you would think he was just an on-looker. Quiet, reserved, shy, this man has been in charge of some of the most spectacular air photography ever made.

"Steene and Dyer and Teurs and the other boys are the ones who have done the real work," explained Perry. He failed to state that there was scarcely a day that he was not in the air himself riding the tail of some ship in a thrilling air battle.

"These boys who specialize in air photography deserve a lot of credit," declared Perry. "I mean the ones like Dyer and Teurs and like Steene was before he passed on. They have ridden in some peculiar old crates in past years, and I never heard any of them make a kick about the danger." But he did not say a word about the chances he has taken himself. Didn't say a word about the days during the shooting of "Hell's angels" when more than a score of ships were in the air engaged in mock aerial combat as dangerous as any of war days when, darting in and about this maze of planes, were a dozen or more ships in which rode cameramen "on the tails" of every ship in the mock fray. It requires iron nerve to dash about among a flock of ships with an accident impending at any moment.

Perry didn't tell us that he put in more than 150 hours in the air himself on this picture. He didn't tell us that he went up first each morning to see what flying and photographic conditions were like.

And Perry did the same thing in "Wings," which was photographed under his cinematographic direction. He did finally tell us about being fastened in the rigging of a captive balloon, high in the air, so he could make close-ups of the actors in the basket.

Then, there is Alvin Knechtel. "Al," as he is better known in picture circles, flies his own ship. Of course he cannot fly and shoot at the same time. But he dashes back and forth through the skies every chance he gets and has figured out many a knotty aerial problem while so doing. And when he has to shoot in the air he is perfectly at home. It was Knechtel who gave us the marvelous air photography in "Lilac Time." But "Al," like the others, doesn't like to talk about his air feats.

Al didn't reveal the fact that when he was "shooting" the picture "Lilac Time" he had a dual control plane and always flew it himself until he had it in position for his shot, when he would signal for his pilot to take it while he got a "shot" few men could get unless they flew their own.

If his pilot got out of position Al would calmly grab the stick, swing the ship back where he could get the best results and start shooting again. But, you never hear him talking about his work. He loves flying and will talk about that.

Billy Teurs is another A. S. C. member who helps put the air thrills on the screen. He and his Akeley and a plane are rarely seen apart.

Not only do the air specialists take to the clouds, but the other boys repeatedly are called on for aerial work. And, anyone who has ever flown knows that to hop into a plane when you are not accustomed to it and forget all about the attendant danger while you think of pictorial art, calls for nerve. But they are doing it all the time.

Clyde De Vinna was shooting on a picture in which a captive balloon figured. He had to make certain shots from the basket on the balloon. They didn't turn out so well. The next day found De Vinna hanging thirty feet beneath the basket. He had fixed up some ropes and a board. On the board was Clyde with his camera cranking away for all he was worth while the tiny platform swayed as the balloon yawed. At Mitchell Field, Arthur Edison some

Continued on Page 34

The late E. Burton Steene, as he used to appear ready for the daily jaunt into the air.

On Tinted Film for Sound Positives

New Process Devised Whereby Tinted Positives May Be Used for Talkies, and the Moonlight May Be Turned On When Wanted

By Loyd A. Jones

[This article is the first part of a paper presented at the Spring meeting of the S. M. P. E., New York City, May 6-9, 1929. The second part will appear in the August issue of this magazine. This paper is also Communication No. 393 from the Kodak Research Laboratories.—Editor's Note.]

POSITIVE motion picture film on tinted support has been available for many years. It has been used extensively, in fact during some periods within the past few years eighty to ninety per cent of the total production has been printed on tinted positive film.

There is little doubt that the employment of material which imparts a pleasing and variable color to the screen adds to the beauty of the production, breaks the monotony of looking for long periods at a plain black and white picture, and softens harsh outlines which otherwise may produce unpleasant impressions. But of much greater importance than these rather incidental aesthetic contributions of color is its great potential power to enhance, by either objective or subjective association, the emotional significance of the scene with which it is associated.

Loyd A. Jones

It must be admitted that the language of color, the more or less precise evaluation of the various hues, tints, and shades, is, at present, in a very rudimentary stage of evolution. Correlations are in many cases subconsciously felt without being consciously defined. It is entirely possible, and in fact probable, that careful study and experimentation may lead to the development of this language or symbolism into a powerful emotional tool in the hands of the master motion picture dramatist.

Recent scientific advances have made possible the reproduction of sound along with the motion picture, the sound record, consisting of a series of photographic images varying either in density or width, being carried on the edge of the positive film band. Although this has added enormous possibilities to the dramatic power of the motion picture, it has made it impossible to continue the use of the tinted positive film which has been employed during past years. The recorded sound is reproduced by the action of light which passes through the record on the positive film and excites a photo-electric cell. The majority of dyes used in making these tinted bases absorb strongly those wave-lengths of radiation to which the photo-electric cell is most sensitive. Hence the response of the cell is so reduced in magnitude that high amplification of the photo-electric currents is required to obtain sufficient volume of sound.

This high amplification increases unduly the inherent cell noises and microphonic disturbances in the amplifier so that the reproduced sound is of intolerably poor quality. As a result, the use of tinted film has been entirely discontinued in the production of positives carrying a photographic sound record. There is little doubt that this absence of color from the screen constitutes a serious impairment of the beauty and dramatic power of the screen production. It is desirable, therefore, that a means be found for producing a tinted positive film which, when used in making sound positives, will not interfere with the satisfactory reproduction of the sound record carried thereon.

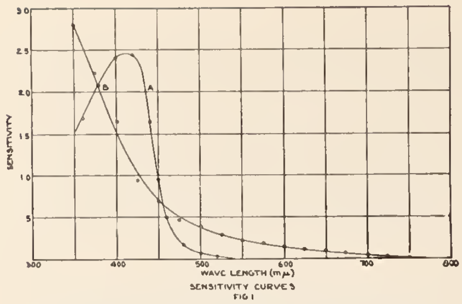
This problem can be solved provided coloring materials can be found which, while absorbing a relatively small amount of that radiation to which the photo-electric cell is most sensitive, will produce, by selectively absorbing the radiation to which the eye is sensitive, colors or tints of the desired hue and brilliance. These dyes, or carefully determined combination of dyes, can be applied to the film base in the usual manner and thus enable the manufacturer to offer a product at no greater cost than the regular clear base positive film.

Another solution of the problem lies in applying the tinting dyes to the film band in such a manner as to leave untinted a narrow strip of proper dimensions and positions on the film band. The sound record can then be printed on this uncolored area and the sound will be satisfactorily reproduced without interference of the tinting material. Unfortunately this method involves a greater cost of manufacture since the tinting dyes must be applied to the individual 35 mm. strip after the base has been emulsion coated and cut into narrow widths. It is obvious that technically this represents the most satisfactory solution. This was recognized by us some considerable time ago and applications were made for patents to cover the idea. Methods and machines for accomplishing this have been devised which give very satisfactory results and it is probable that this material will be available in the near future.

The first solution suggested, namely, the use of dyes or other coloring materials applied over the entire area of the film and so adjusted spectrophotometrically as to transmit freely the radiation to which the photo-electric cell is sensitive, seemed worth further study and after a rather lengthy series of experiments a number of satisfactory tints have been obtained. These represent the entire gamut of hue and, in our opinion, are of the most satisfactory depth or color saturation for use in applying color to the motion picture screen.

In approaching the problem of selecting dyes for this purpose it is necessary, first of all, to determine just what wave-lengths of radiation most strongly excite the photo-electric cell with which the tinted material is to be used. It is necessary, therefore, to determine the spectral sensitivity of such cells. Photo-electric cells may be made by using any one of several different materials, such as potassium, caesium, sodium, and other alkali metals. These may be of either the evacuated or the gas-filled type. The spectral sensitivity depends upon many factors and as a result cells differing enormously in spectral sensitivity are available. To the best of our knowledge, however, there are only two types of cells used extensively in commercial installations for the photographic reproduction of sound. One of these, manufactured by the Western Electric Company and used in the equipment installed by the Electrical Research Products Incorporated, is of the potassium gas-filled type. The other, used in the equipment installed by the Radio Corporation of America, is of the caesium type.

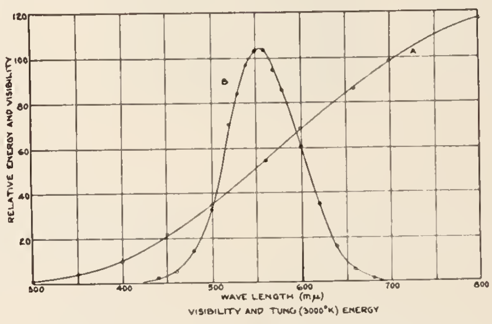
In Fig. 1 are shown the spectral sensitivity curves of these two cells, curve A being that for a potassium and curve B that for a caesium cell. The ordinates of these curves are proportional to the photo-electric currents generated when excited by equal amounts of energy of



Spectral sensitivity curves for potassium gas-filled type photo-electric cell (A), and for caesium type photo-electric cell (B).

the wave-length as indicated by the abscissa values. The proportionality constant used in plotting these curves is not the same for the two cells and hence these curves cannot be interpreted as indicative of the relative total sensitivities of the two cells. They do show, however, the way in which sensitivity varies with wave-length and this is the information in which we are particularly interested at present. The monochromatic radiation used in the determination of these sensitivity functions was of high spectral purity, being obtained by using two monochromatic illuminators operated in tandem so as to effectively eliminate all scattered radiation. The photo-electric current generated was measured with a high-sensitivity galvanometer. The amount of energy incident upon the photo-electric cell was measured by means of the thermopile and high-sensitivity galvanometer.

Since the thermo-electric current is directly proportional to the energy incident upon the thermopile (regardless of wave-length) it follows that the sensitivity of the photo-electric cell, defined in terms of the photo-electric current per unit of energy, is directly proportional to the ratio of the photo-electric current to the thermo-electric current, P_c/T_c. Every precaution was taken to eliminate all possible errors and it is felt that the curves in Fig. 1 represent with high precision the sensitivity of the cells in question. The author is indebted to Dr. Otto Sandvik of these laboratories for these data.



Visibility and tungsten energy (3000°K): A, relative energy of radiation from tungsten at 3000°K. B, relative visibility of radiation from the same source.

The curves in Fig. 1 show the relative magnitude of the photo-electric currents resulting from the action of equal amounts of energy of different wave-lengths. In practice, the photo-electric cell is excited by an incandescent tungsten lamp which does not emit equal amounts of energy at all wave-lengths. To obtain the effective spectral response curve it is necessary to know the spectral distribution of energy in the radiation emitted by the incandescent tungsten lamp. This depends upon the temperature at which the filament is operated. In commercial sound reproducing installations this is approximately 3000°K. In Fig. 2, curve A shows the relative intensity of the radiation emitted at different wave-lengths for this source. It will be noted that relatively little energy is emitted in the short wave-length region to which the photo-electric cells are most sensitive, while relatively large amounts of radiation are emitted at longer wave-lengths.

In Fig. 3 are shown the effective spectral response curves for each of the two cells when used with a tungsten lamp operating at 3000°K. The ordinates of these curves are determined by multiplying, at each wave-length, the ordinate of the sensitivity curve (see Fig. 1) by that of the tungsten energy curve, Fig. 2.

It will be noted that the response curve of the potassium cell (A, Fig. 3) has a relatively high sharp maximum at wave-length 425 mμ. It decreases rapidly for both longer and shorter wave-lengths reaching a value of 10 per cent of the maximum at 490 mμ on the one hand and 340 mμ (estimated) on the other. The effective response curve for the caesium cell is shown in Fig. 3, curve B, and is of a broad flat type having a maximum at 420 mμ. For longer wave-lengths the response decreases gradually reaching a value which is 10 per cent of the maximum at approximately 750 mμ. The response at 700 mμ, the long wave-length limit of the visible spectrum, is 35 per cent of that at the maximum. It will be noted that the maximum of response is at practically the same wave-length for these two cells, although the caesium cell has a much broader spectral sensitivity than the potassium cell. It is evident from a consideration of these response curves that any coloring material which absorbs strongly in the region between 400 and 500 mμ will have a relatively high density if measured in terms of this photo-electric cell and a tungsten lamp.

These wave-lengths impinging on the retina give rise to the colors described quantitatively as violets and blues and if these wave-lengths are absorbed from white light the remainder produces a yellow color. Yellow dyes in general therefore have high photo-electric densities. This is true qualitatively for both cells although it applies with much greater force in case of the potassium cell which has a relatively narrow sensitivity band in the short wave region. As a result of the difference in shape of the response curves, certain colors, such as yellows, give relatively lower photo-electric densities when measured with the caesium cell than when this quantity is determined by means of the potassium cell.

The eye is a receptor of the synthetic type and does not analyze a heterogeneous radiation into its component parts. The sensation arising from the impingement of heterogeneous radiation on the retina has a single hue characteristic and identical sensations of hue may be excited by heterogeneous radiations differing very widely in actual spectral compositions as determined spectrophotometrically. It is evident, therefore, that there is a possibility of obtaining a desired color by several different types of spectral absorption curves. Since the radiation required to actuate the photo-electric cell is localized in a very definite wave-length region, it follows that course to be pursued in the solution of the problem in hand is to select absorbing materials which most eeffectively transmit thes wave-lengths and at the same time most completely absorb those wave-lengths which, when substracted from white light, operate most efficiently toward the production of a color having the desired hue and saturation characteristics.

In order to proceed most directly and logically in this direction, knowledge of the visibility of radiation is of considerable importance. This knowledge is of assistance in deciding just what particular type of selective absorption will most efficiently produce a desired color and, at the same time, most efficiently transmit those wave-lengths which are required to excite a photo-electric cell. Curve B in Fig. 2 shows this visibility function, the ordinates being proportional to the magnitude of the

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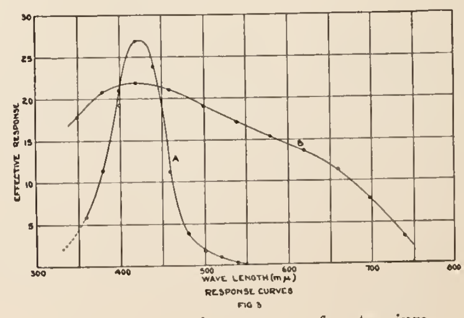

Effective spectral response of potassium cell (A) and caesium cell (B) when used with a tungsten lamp operating at 3000°K.

Better Modelling Lights

A Timely Discussion of Incandescent Lighting Equipment Now Generally In Use In the Making of Sound Pictures by an Expert with an International Reputation.

By R. E. Farnum
Engineering Dept., National Lamp Works, G. E. Co.

High efficiency incandescent lamp equipments used for general lighting purposes are now well established and known to the studio staffs generally. They result in a marked improvement in the amount of light available from a given lamp wattage. These units direct more than 40 per cent of the light output of the lamp into areas where it is useful as compared to 15 per cent with the older types in which no effort was made to accurately control the light. The principles underlying the design of the more efficient types have been discussed in a previous communication.

Modelling lighting equipment is usually required to produce illumination of from two to four times and not infrequently ten times the intensities from the general lighting equipment. Since the illumination values for general lighting usually range from 200 to 500 foot-candles, the modelling equipment may at times be required to produce intensities as high as 2000 foot-candles or even more. The area over which this higher intensity is necessary is limited so that lighting equipment which is capable of projecting a beam of light with a spread of 8 to 30 degrees is most satisfactory.

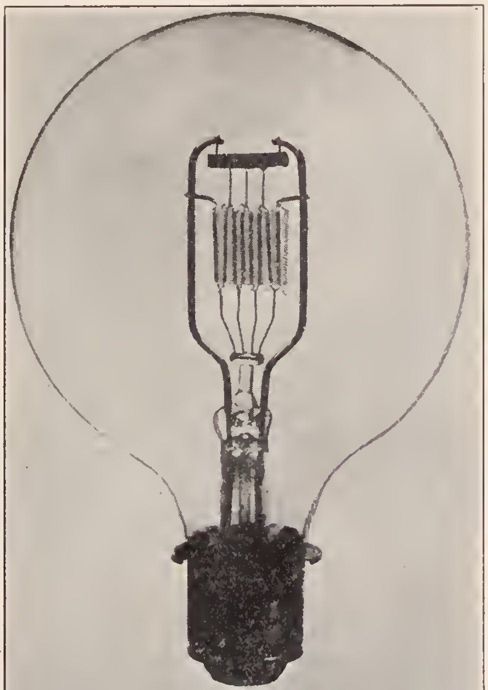

Fig. 4 Images of coils meshed between filament segements

Both lens and reflector spotlights are employed for this service and each type has its own particular advantages and disadvantages.

The beam spread of the lens spotlight is capable of continuous adjustment through the required angles and the illuminated area is always satisfactorily uniform in intensity. Furthermore, all of the light emitted is confined to the beam and there is no objectionable "spill." Unfortunately, the amount of light intercepted by the condensing lenses, representing the best present designs, is only about 8 per cent of the light output of the lamp. With a spherical mirrored reflector placed behind the lamp to redirect additional light into the beam, this is increased to 12 per cent, an amount of light which limits the application of the lens spot to the shortest throws and "close-ups." Reflector spots which incorporate an accurately made paraboloidal mirror with a focal length from 33 to 40 per cent of the mirror diameter, intercept solid angles of light up to approximately 140 degrees. Thus the volume of light in the beam of the reflector spot is of the order of four times that of the lens spot and its field of usefulness in studio service is much greater.

For beam spreads beyond approximately 16 degrees the illuminated area from a reflector spot becomes increasingly non-uniform and the use of light controlling cover glasses becomes necessary. A single accurately made door, giving an added beam divergence of 10 degrees both vertically and horizontally, meets the most common demands and makes it necessary for the studio to have available only a single type of spreading door.

The light from the front of the lamp issues through a wide angle and if uncontrolled this "spill" light may interfere with the effectiveness of the unit. Baffles are often used to screen this extraneous light from the upper walls of the set. Spill shields incorporated in the lamp housing are not so efficient since they absorb light that might otherwise be useful and at the wider beam spreads much of the light in the useful beam is intercepted by the shields. A very satisfactory method of not only eliminating the spill light but of strengthening the main beam is to use a spherical mirrored reflector placed on the front side of the lamp. For the 2000-watt G-48 bulb spotlight lamp so commonly employed for medium range spot and back lighting, a spherical mirror having a diameter of 6¾ inches and an outside radius of curvature of 3¾ inches should be used. The spill light is, of course, completely eliminated and furthermore the intensity in the main beam is increased about 30 per cent for all spreads from 8 to 30 degrees. Sometimes people have asked whether such a spherical mirror will not give the

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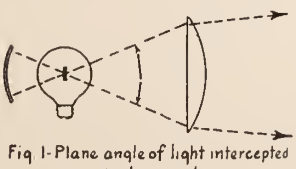


Fig. 1-Plane angle of light intercepted by lens spot

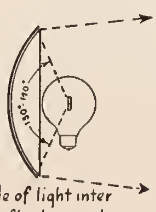


Fig. 2-Plane angle of light intercepted by reflector spot

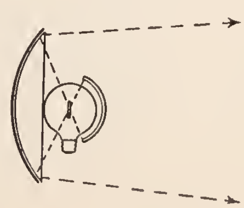


Fig 3-The smaller spherical mirror adds about 30 percent to the light in the beam.

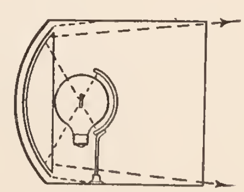
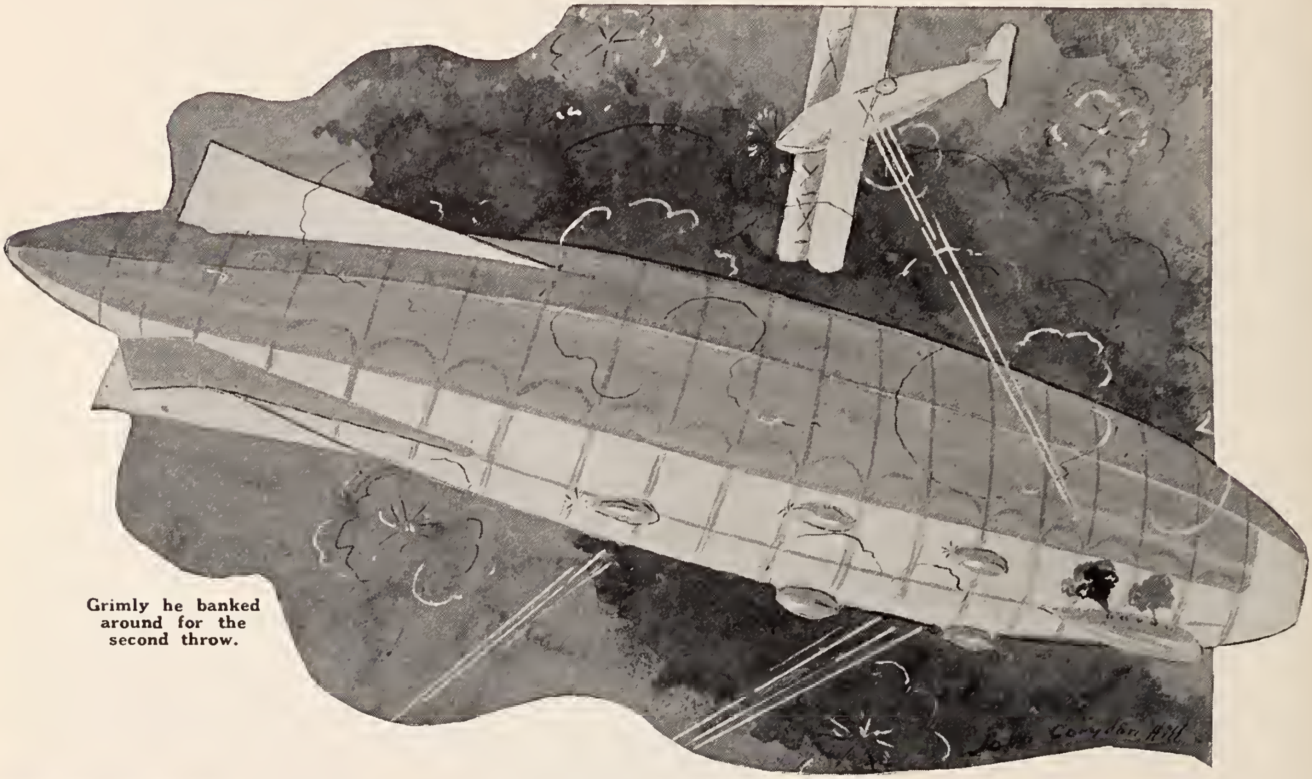
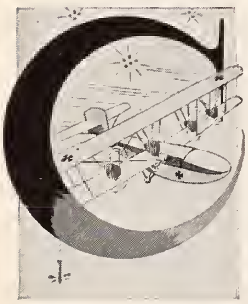


Fig 5-Old type unit wastes much of the light when beam is spread

ACCOMPLISHMENT



Grimly he banked around for the second throw.



COLONEL WYNDAM STANDISH, commanding R. A. F. Pursuit Squadron 490, regarded with something akin to respect the operations of a German spy at the Croydon Airdrome who was sending much information to Germany and was leaving no clues as to his own identity. The Colonel felt sure it was only one spy from the way the espionage operated. Had there been a group of spies, some one would have made a mistake, thereby leaving the one clue for the colonel or the I. D. counter-espionage men to pick up a chain of evidence and work out a solution to the mystery. As matters stood, the British I. D. operatives and the air forces were baffled, and the spy was becoming more audacious than ever.

Only last night a Zeppelin had come over and bombarded Croydon while all pursuit plans were thirty kilometers away, waiting for the Zep to raid where it had been reported. Two nights before, a flight of 4-motored Lizenz Bombers had bombarded the munitions warehouses at Suydan-on-the-Thames, just as a merchantship was loading for a trip across the Channel. All R. A. F. pursuit planes had been sent hell-bent to fight off the raiders who were expected over London. There were numerous other incidents equally as tragic and as well executed by the spy within the past month. The German raids, which had been executed with such precision without a shot being fired by England, and the fact that nobody was arrested or even suspected, proved conclusively that only one man, a master, was planning and executing the coups.

Colonel Standish scowled. He knew that if this did not stop, he, an old veteran, would be demoted and sent to some obscure training camp to drill recruits, He muttered wrathfully at his report-littered desk and glowered fiercely as a clerk entered the office.

"Sir, Captain Wilton is back," the clerk announced.

"Send him in," the colonel snapped, laying aside his cigarette butt, and the wrathful glitter in his eyes changed to a glow anticipating good news.

He surveyed the six-feet-two, blond, athletic aviator who had entered, snapped to a rigid salute, and said:

"Mornin', suh!"

"Good morning, captain," the colonel returned the salute, "you Americans speak with a slow drawl, but if you are all such hellions for action as I know you to be, the Kaiser will soon be peeling spuds for our private soldiers. Now, what's the good word, captain?"

"None, suh," came the solemn reply of Captain Delavan Wilton, late of Texas and at present ace pilot of the 490th Pursuit Squadron, R. A. F., "that damn spy is as free as the air we breathe."

The colonel's face began to take on the purple of rage and disappointment.

"Ye gods!" he groaned, on the verge of an apopletic fit. "Hi say, Wilton, 'aven't you found out hanything?"

The colonel got his "h's" misplaced when laboring under great stress.

"Nuthin', suh," was the drawling reply, "but buck up, suh, that Heinie hasn't got us roped an' hawg-tied yet!"

"Hoh, well," the colonel muttered philosophically, after a moment, "hi'll be pensioned in a few years hanyway."

"Eh?"

"Nothing, Wilton. Er—Sheila phoned I should invite you to tiffin—com-on, time to go now. Let's forget this bloody war for an hour."

Wilton grinned.

"Darling Sheila," he said in a low, fond tone as he assisted the colonel into his topcoat, "she's the kind of woman who makes this damned war bearable."

"Yes, Wilton," the colonel answered, after they were seated in the staff car, "but she worries me. When her mother died I had to raise her the best I knew. Now she's twenty and needs other companions besides a rough-

A Story of Love, Movies, Romance, Aviation and Adventure

By A. Kinney Griffith

Illustrations by John Corydon Hill

neck old father. And I don't like her associates over at the motion picture studio. If I am ordered to France she'll be . . . ."

"She once told me she would like to join the Waacs," Wilton interrupted.

"No, sir! I won't 'ave it, Wilton, she's not strong enough," the colonel replied vehemently. And so they argued until the car slid to a halt in front of the Standish residence.

TIFFIN was served at ne in the afternoon while Colonel Standish was stationed at Croydon. There were no servants, so Sheila Standish, a beautiful, blue-eyed girl with the slenderness of a wild goldenrod, had prepared an excellent repast. She served the food and ate daintily, for the most part remaining silent, listening to the conversation between her father and the visitor.

She was always glad to have this tall American captain at the house, but at times he was such a terrible bore with his everlasting talk of war, army, airplanes, spies—even now, over the second cup of tea, she felt like screaming with the monotony of the conversation. Why couldn't Del Wilton be like Sir Charon Haydon-Winnington?

She was fond of Del Wilton, but—well, differently. Of course, she would always want Del somewhere near. She realized that as she stole a glance at him sitting opposite her. Good and strong, Del was. Too good and strong, she thought, watching him. He wasn't—well, he wasn't romantic like Sir Charon. Sir Charon had dark eyes, eyes that sometimes had deep fires in them. He could say things that did not mean just what the words said because of the way he uttered them. She never would entirely understand Sir Charon Haydon-Winnington.

But Del Wilton? She smiled that the thought. Dear old Del, always the same; gentle in a wholesome, bear-like way, a little pathetic in the completeness of his adoration for her. No, there was no mystery about Del.

Still, she regretted having promised Sir Charon to go riding this afternoon. But it was her dad's fault, because he kept her penned up so much. And Del had no strings on her. He'd been proposing regularly for a year, but always she had smile, patted his arm, and said, "sometime, maybe after the war." No, Del had no strings on her. Her father could entertain him—they'd be going back to the office soon, anyway. Having worked herself into this frame of mind, she found courage to announce her program. She got to her feet a little aggressively.

"I must change," she said, interrupting their conversation, and, when both had turned their eyes upon her, she continued lamely, "I—I am going out."

The coloned looked his astonishment. "Where?" he asked. "You're not working on a picture now."

"Riding with Sir Charon Haydon-Winnington," she replied.

Down it went like a flaming rocket.

Colonel Standish's tilted chair hit the floor with a bang. "Strike me pink! Who is this Sir Watzisname?" he demanded, the usual purple mounting to his temples.

She had expected something like this. "He's a very dear and distinguished friend of mine," she told him, her head high, nostrils aquiver, eyes glittering.

"Yair? Why hain't I met him—never 'en hear o' him." The colonel's grammar was again haywire.

But there was Standish blood in Sheila, too. "Because I haven't come to the point where I want to confess that I am only a commoner's daughter," she flared, and the emphasis on the word made both men see red.

"Well, gor-blimey—" her father exploded, but Del put out a strong hand and forced him back into his chair. Still gripping the colonel's arm, Del Wilton turned to Sheila, who stood trembling, angrily defiant.

"Wait a minute, honey," he began conciliatingly. "Who is this bloke, that meeting a couple o' commoners is goin' to mess him all up?" He strove to put banter into his tone, but the edge of resentment was there, and Sheila sensed it.

"He's of the diplomatic corps," she answered, turning her angry gaze full on Del.

"Well," he said, "he shore has used diplomacy with you-all."

Colonel Standish, his flare of temper passed, chuckled. That was a mistake, because you could not chuckle at Sheila Standish's expense and get away with it.

"Which is more than a soldier will ever do!" she snapped and with head up, haughtily left the room.

The two men sat in silence, avoiding each other's gaze. Presently they heard her talk with someone in the hall, winced as the door slammed behind her; then, moved by a single impulse, hurried to the front windows in time to see her take her seat in a smart, blue roadster beside a civilian in white knickerbockers, and a grey tweed coat.

WHERE to, Ma Cherie?" Sir Charon asked as they rolled away from the curb.

Sheila liked that "Ma Cherie." It was so typical of Sir Charon, and it sounded so exotic.

"Let's drive over Berkshire way," she suggested, "they're shooting scenes in one of 'Baby Bab's' serial pictures there, and I want a lot of this fresh air and sunshine."

Out beyond Wimbledon, Sir Charon turned the roadster off the main highway, guiding it slowly through meticulously groomed estates to the wilder, more beautiful farm land still farther from the beaten highway. They were idling along a level stretch within sight of the picture company's location when Sheila grasped his arm exclaiming ecstatically: "Look, Sir Charon! That goldenrod! Isn't it gorgeous! Please stop so I can get some!"

For a while they gathered goldenrod, Sheila pausing occasionally to exclaim delightedly over the length of some, or the fullness of that one or the deep yellow of the other one. They returned to the car where Sheila arranged her flowers. While she sat literally buried in them, Sir Charon slipped an arm around her.

"'Twill be you and I pretty soon, my sweet," he whispered. She had an uneasy feeling that he was suggesting more than the words implied, but that was Sir Charon's way. She was aware, too, that it was the first time he had called her "my sweet." Somehow, she did not like the expression. Although it was not as thrillingly romantic as she had pictured Sir Charon's proposal would be, she relaxed in his embrace ready to yield to a kiss, but the wild fire in his eyes that once had seemed so alluring, actually repelled her. He was looking into her, through her, seeing things he had no right to see. She pushed him away.

"Not yet, Sir Charon," she said. "I—I cannot promise—but I won't say no. I mean, I won't say anything. Oh—please, let's go back now—Here . . . ."

With a few deft movements of her slim hands, she braided several slender stems of the goldenrod into a chain, and reaching for his right lapel, entwined the goldenrod in the buttonhole.

"What's that, my sweet?" he asked, trying to grasp her fingers.

She eluded him. "A goldenrod chain," she laughed. "I braided it especially for you. Wear it, it will bring you luck."

"Will it bring me what I want most?" he asked.

"One never knows," she smiled, "let's go now."

He turned to the wheel, sighing; a sigh that was all even Sheila could ask for. "All right, Ma Cherie," he said tenderly and started the motor.

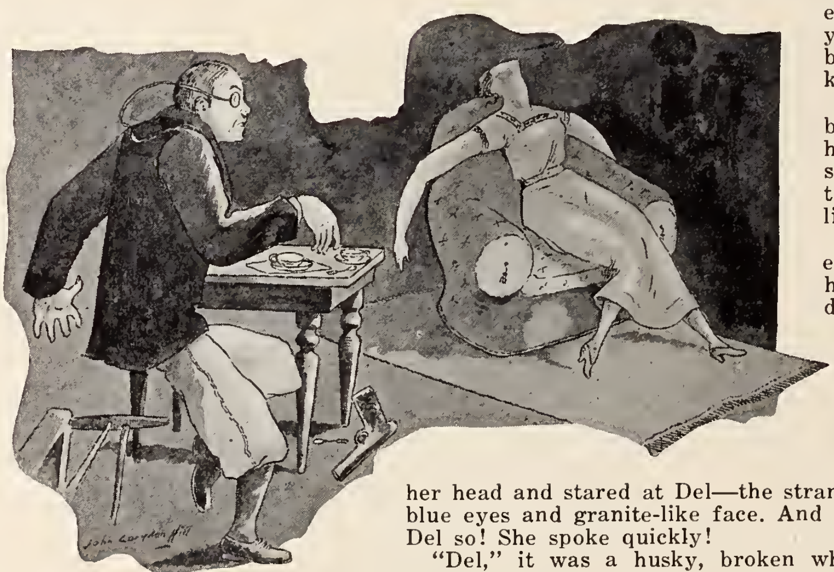
"Cripes!" came an enthusiastic voice, a short distance away. "That certainly was a good shot! I got it all from the moment you entered the car. It was a most natural picture, Miss Sheila!"

Sheila and Sir Charon looked up in astonishment to behold a cameraman of the Baby Bab company picking up his camera and walk off back to the company. "I'll bring you the film in a few days," he shouted over his shoulder.

"Hell!" Sir Charon snapped. "That fool took a picture of us! I'll get that back!" His eyes glowed murderously and he started to get out of the car.

"No, please!" Sheila said, and grasped his arm. "Let him go. It will be scads of fun to see ourselves that way—no acting—it will be really natural!"

"Well, all right," he grumbled, "if you don't mind. It may help you at that, eh?" With that he started the car. They drove over the route she had suggested, stopped at an Inn for dinner, and had several dances. For the last hour he had seemed nervous, anxious to return. They scarcely spoke as he pushed the powerful roadster over the road.



It was after midnight when they arrived at Sheila's home. Before she alighted, she leaned over quickly, and ever so slightly, brushed her lips gainst Sir Charon's cheek. Then nimbly, she stepped from the car, and avoided his passionate gesture to embrace her.

"Good night," she called, and skipped up the steps. Quietly she tip-toed to her room where a few minutes later she sat on her bed, knees under chin, a very alluring huddle of silk and soft body.

What to do, now? Sir Charon had asked her to marry him—Suddenly, despite the warm summer night, her room seemed chill. He asked her to marry him? She hid her face in her robe, shamed by the thing this thought had suggested. Of course he had! But, every time Del had proposed there had always been talk of "marry" and "wife" and "home" and the "States"—but, well Sir Charon was so different. And those eyes of his! They were so cabalistic, or were they just eyes that clothes could not keep out? She wondered, and wondering slept.

AT DAWN someone called her from the Croydon Hospital to inform her in professionally calm tones that her father was there—dead! The third time that calm voice repeated the message she believed it, and fainted.

Captain Del Wilton came at noon. But this was not the lover who had pleaded so abjectly for her affection. This was a stranger who stood stiffly across the room. A stranger with steel-blue eyes and a granite-like face who spoke in cold, crisp tones:

"We don't know what happened, yet," he informed her. "I left he-re shortly after you-all yesterday."

Sheila, face in her hands, wept convulsively at the recollection of that stormy parting, while Del waited for her to raise her eyes. When her sobs ceased he continued.

"Some time after I left, Martin Lewis, an I.D. man, came. That we know, and we know, too, that Mart is on a slab at the hospital with a chest full o' bullet holes. They found him back of the wireless station at the airdrome. The wireless operator was found dead at his post with a knife in his back—and a Zeppelin bombarded the docks at Sheerness while all our pursuit planes were ordered to be ready for a raid on London. Your father was found shot from behind while at the controls of his plane. The moter was runnin' ready to take-off."

Sheila sobbed hysterically.

"The I. D. men believe," Del continued, "that Mart found a clue and summoned your father, and that they tried to ambush the spy at the wireless station or the hangars. They probably reckoned the two of them alone would have better chances of catchin' the spy than if they got a squad of soldiers. It was a brave thing to do—them not knowin' what to expect — but then, your father was the bravest man I ever knew."

Sheila, sensing rebuke in this, bowed her head in grief. If she could have yesterday afternoon to live over again!

"I'll take care o' everythin'," Del said hesitantly at the door. "If you'll have a list of relatives an' things ready tonight, I'll come over an' take care o' that, too."

Sheila raised her head and stared at Del—the stranger with the steel-blue eyes and granite-like face. And she needed the old Del so! She spoke quickly!

"Del," it was a husky, broken whisper, "if you—if you can find the man who killed dad, I'll marry you the moment you say the word."

Before he answered, she realized she had offered herself to a stranger with grim eyes in a grimmer face, a stranger who didn't want her!

"I don't want you-all to marry me," Del said crisply, and went out. His clenched fist driven to her mouth would have hurt less. Yet, she felt no anger. Her spirit and courage were gone. The room whirled and she sank back into her chair.

Directly after the funeral services Del sought Sheila out alone. She swayed toward him because she needed him, increasingly with every fleeting minute. She almost raised her arms to him. But he merely put forth a hand to grasp her elbow, an impersonal hand such as he would have extended to any woman who required assistance.

"I'll be goin' now," he said. "But I'll always be on tap in case you-all need me." He paused, then, like a sullen boy, continued: "that is—if you-all should re-quire the help o' a commoner."

She tried to speak, choked, and put forth a hand to stay his going. But Del was gone, and she knew why. He had loved her father; had loved her too, and only two days ago she had humiliated them both, and for a suave dispenser of cheap compliments who had not so much as telephoned her since that evening.

THREE weeks passed. Weeks in which Del Wilton lived in hell. Four consecutive times alarms had come in that the German air fleets were coming to raid, and each time he had led his squadron into the skies to meet the invaders, only to find they had again been tricked. And the raids were becoming more terrific. Everybody, from parliament to peasantry, was howling for vengeance. Yet the war birds and the I. D. men were baffled, handicapped, unable to do a thing to end the enemy raids.

Then, one night while waiting for the inevitable alarm, Del Wilton deliberately disobeyed orders when it came.

"Zeppelins reported over Kolkestone," said an official voice over the telephone. "You will take off at once to intercept them—and bring them down—at all costs!"

Del snapped into action, bellowed orders, and in a few minutes the airdrome seethed with activity. Eight sleek Bristol Fighter planes were trundled from their hangars and their big Rolls Royce motors revved up. A few more minutes, then Del gave the signal and the eight swift fighting planes roared down the runway and swept into the night.

But, instead of going south as he had been ordered, Del lead his squadron in a wide circling climb, then turned east. At 5000 meters which was high above the drifting clouds, he cruised in a wide circle. What, he heasoned, would be the sense of the Heinies bombing Folkestone—an unimportant seaport—when, by flying twenty kilometers farther, they could bombard London itself.

While cruising, Del kept his eyes on the world-wide heavens and as the moments passed by, he began to wonder if his hunch would bear fruit after all. He could visualize what would happen to him if he failed after his direct disobedience of orders.

Then suddenly, out of the star-lit southern sky came two big, blunt noses, and they were coming fast!

"Two o'them! Just as I reckoned, by God, an' headed directly for London. He yelled those words aloud to himself. He fired a Verys flash, a signal to his squadron mates, then with motors roaring wide open the eight Bristols, with Del in the van, darted head-on to meet the gigantic Zeppelins.

Del was first to zoom and shoot. The next few minutes were as a nightmare to both English and German airmen. Searchlight rays sweeping from the control cabins of the Zeppelins created a ghostly, weird scene, as the mighty air monsters fought off the fire-spitting planes. Those Bristol Fighters were swarming around the Zeps like a flock of chicken hawks attacking two wild eagles.

The twin Vickers machine guns firing through the propeller arcs of the airplanes answered bullet for bullet from the gun tunnels of the Zeppelins. Sizzling streams of bullets flashed everywhere and Del was in the thick of the furious mixup. He flew and shot like a demon of the air. It seemed here was his one chance to purge his body of all the vengeance therein contained; at the same time put an end to the diabolical raids on England.

When the top-side tunnels of the Zeps had been strafed clear of machine gunners by his squadron mates, Del swooped in to drop his first Rankin Dart. His was the only plane equipped with these dangerous little bombs, so upon him fell the burden and danger of maneuvering close enough to the sky monsters in order to drop the darts upon the big hulls.

He made one lightning-like zoom and dropped the first dart. It hit and its needle-like point punctured the big Zep square. There the dart wavered and its fuse began to glow. Del headed full speed away from the Zeppelin. And well that he did for suddenly the Zep exploded with such a crash and concussion that the world seemed rent asunder.

Down it went like a flaming comet, followed a moment later by a Bristol which had been so near that the explosion tore it apart. Back Del came, like a hungry wolf, and again he zoomed at the next Zeppelin. Again he threw a Rankin Dart, and missed. Grimly, he banked around for the second throw, and this time was successful.

Again a needle-like dart punctured the big Zep. Then the glowing fuse and an explosion. At a safe distance Del banked and watched the downward plunge of the shattered monster. It was a fearful sight. Yet somehow Del felt a strange surge of elation. He felt he had ended the slaughter of innocent and defenseless citizens for once and forever. He felt he had avenged his friend Colonel Wyndam Standish.

He leveled off and scanned the dark sky for his comrades. He fired a Verys. Only three planes answered the summons. The others had "gone west."

For only a second he stood there

THE next morning, Del Wilton was hailed before the commander-in-chief. Generals slapped him on the back and called him hero! In a happy daze he listened to the Marshal's eloquent panegyric and felt the Distinguished Service Cross being pinned to his chest.

Sheila Standish read of the event in army bulletins that day. She, too, was in a daze. Her heart leaped wildly over the honor bestowed upon Del, but the next moment brought the same old feeling of despair. Day in and day out, she had walked from room to room, striving to keep her gaze from those things which had been particularly precious to her father. She found she could not, for every turn brought her eyes to some object that had been doubly dear to the man whose genial, grumbling bass never again would fill the rooms so cluttered with the souvenirs he had gathered from all over the world.

Loneliness, like some evil, unclean thing, stalked beside her with noiseless tread. She turned to the telephone. She would call Sir Charon. It occurred to her then that she could not. He had given her no telephone number. Always he had communicated with her. Until that dreaded day he had called daily.

Twenty-one days of bitter anguish and bitterer self-reproach. If only she could have that day to live over again. If only Del would call. Why hadn't she heard from Sir Charon? Then she did hear from him. She spoke of her father's death.

"Ah, yes, Ma Cherie, a lamentable tragedy," said his voice over the telephone in the tones she loved so well. "Is there any trace of who did it?"

"None," she answered resignedly, "I don't believe we'll ever know."

"Oh, my sweet, that's too bad, indeed," Sir Charon comforted. There was sympathy in his voice. A pause, then: "Can I see you?" His tones were confident and soothing.

Continued on Page 40

As the Editor Sees It

. . . . "And as I walked along
There was no sound,
Save where the wind with long
Low hushes whispered to the ground
A snatch of song.

No thought had I
Save that the day was fair
And fair the sky
And God was everywhere." . . . .

TO THOSE of us who are harried by the hustle and bustle of a hectic struggle for existence, the above line mean much. They, for the moment, carry us to the solemn mountains; to the placid lakes; to the broad green valleys where foam-flecked streams sparkle beneath the summer sun; to spots far from the pettiness we find in the crowded centers, and bring peace, rest, —and make us think of things that sweeten souls so often bitter from the daily buffeting.

Have you ever noticed that men who are constantly in contract with the beauties of nature rarely do the things that are small and mean? Our gangsters and professional gunmen usually are spawn of the gutters of squalid sections of the big cities. Perhaps if more of us were able to meet nature face to face we would find a new philosophy, a philosophy of love, a feeling that God is everywhere, and the world would be a sweeter place; life would lose its bitterness; laughter would take the place of many tears.

Regarding Mental Fare

WITH this issue we start printing fiction in the American Cinematographer. Naturally, we hope our readers will not only like our first story, but will also like the idea of having fiction in a magazine that is primarily a technical publication.

Experience and a study of history teaches us that there are always some individuals who resent anything new; any change in policy. So we expect to hear from some readers who will want to know why fiction in a cinematographic magazine. To those we explain in advance. Our object is to make the American Cinematographer the most interesting magazine in our particular field. To do this we feel that variety of subject matter will be invaluable. To the writer nothing tastes better than fried brook trout—but, if I had to eat said speckled beauties three times a day for a year I would feel like taking a leaf out of Nebuchadnezzar's notebook and go out and graze with a herd of dairy cattle.

And so it is with magazine contents. The average reader, we feel, wants the scientific and technical which has always been the backbone of our magazine. We also feel that many of them will welcome something more. So we shall continue, as always, to emphasize the scientific articles; lead the field with them. But these will be the piece de resistance, feature articles of human interest will be the salad, and fiction will be the dessert. We hope it will be liked.

The Future of Color

WHAT part will color play in the future of motion pictures? That is a question on nearly everyone's lips since the opening of Warner Brothers de luxe attraction "On With the Show." In this picture we see the first sound feature in color, and it has proven effective and beautiful—another milestone in the development of the picture art.

It is not so long ago that Doug Fairbanks gave us our first silent feature in color, "The Black Pirate." That stimulated interest in color, but black and white continued to prevail. However, color sequences followed and most pictures that aspired to greatness, from the point of "production values," had some color injected in sequences that lent themselves to color.

And now "On With the Show" has made its bow as the first all color talkie, and without a doubt color will catch on with a rush that even the most enthusiastic boosters of color never dared to predict. For some time many of those in whose hands the production of the future rests have predicted the all color picture.

Everybody follows a success, and nowhere more so than in the picture business. If a producer makes a successful society drama the others follow; and unless the production powers of picturedom suddenly turn over a new leaf, it looks as though the rush for color will resemble a bargain sale at a department store.

A brief analysis of the vast field of amateur movie makers shows that the country is rapidly becoming "color-minded." Kodacolor and Vitacolor are taking hold among the amateurs in a fashion that proves the public likes to see natural color on its screen.

And now that talking pictures are a reality, color helps carry out the illusion and makes one forget that he is watching a shadow. What the future holds in the way of color is a question no one can answer, but the wind is blowing colorwise.

Glen Kerschner's Cartoon

FEW organizations can boast of a man of such versatility as has Glen Kerschner, the man who drew the cartoon dealing with the Isle of Lost Ships. Glen can wield a clever pen, do a bang-up job as a cinematographer. shoot unusually fine "stills' or paint an excellent picture. His cartoons will be a monthly feature hereafter in The Cinematographer.

Sol Polito, the chief cinematographer on the picture featured in this conth's cartoon, is one of the best known men in the profession. He is a member of the Board of Governors of the American Society of Cinematographers. His most recent pictures include "The Shepherd of the Hills," "Scarlet Seas," "Man of the Moment," "Broadway Babies" and others.

Irvin Willat, the director of the picture has made some wonderful sea pictures and is noted for his ability in this line, as well as his ability to direct any type of picture. Among the outstanding pictures of the seas to his credit are "Behind the Door," "Below the Surface," "Yellow Men and Gold," "Partners of the Tide," "All the Brothers Were Valiant," "On the High Seas," and others.

Appreciation

THE increasing flood of letters from amateurs in all sections of the United States congratulating us upon our Amateur Department sends a warm glow through the editorial veins. That the amateurs appreciate an amateur department in a professional's magazine is being evidenced daily by an increase in circulation far beyond the fondest dreams of the board of editors. As in the past issues, we shall endeavor to give our amateur readers articles that will be of real assistance.

A. B. C. of Sound Pictures

By Joseph A. Dubray, A. S. C.

(Fourth Paper)

AFTER the invention of the telephone, Graham Bell visualized and brought into practice the possibility of transmitting sound at a distance without the use of connecting wires and through the agency of light.

Graham ell took advantage of the remarkable property of Selenium to alter its electrical resistance proportionately to the intensity of the light to the influence of which its is submitted.

In order to bring about the necessary alterations in the intensity of a source of light striking what we would call a Selenium Cell in rhythm with pre-determined sound waves, Graham Bell devised an apparatus which he called the **"Photophone."**

This apparatus consisted of an optical system condensing a source of light, natural or artificial, to the back of the vibrating diaphragm of a telephone transmitter. The surface of this transmitter was polished so as to have the high reflective power of a mirror. When the diaphragm was at rest it would be so set as to reflect the light in a desired direction.

The reflected rays were collected by a lens which would force them to follow paths parallel to each other. This beam of parallel rays was made to strike a parabolic concave mirror, the reflecting surface of which would force them to converge at its focal point.

A Selenium Cell was placed at this point.

This cell was constructed of a number of thin brass discs alternated with smaller mica discs. The interstices between the several brass discs, which resulted from the fact that the mica discs were of a smaller diameter, were filled with melted Selenium.

The Selenium cell, or resistance, as we may call it, was made to be part of an electric circuit comprising a telephone receiver and a battery.

When the diaphragm of the transmitting instrument was at rest the rays of light, reflected by the surface of the mirror, would strike the Selenium cell at the maximum of their intensity; but, as soon as the transmitting diaphragm was made to vibrate, the parallelism of the rays of light would be destroyed and due to the change thus brought in the angle of reflection of the rays of light incident upon the parabolic mirror, the degree of concentration of the reflected light striking the Selenium resistance would be altered. This would alter the electrical resistance of the Selenium and the strength of the current flowing in the circuit would thus be submitted to rapid changes in accordance with the vibration of the transmitting diaphragm. The diaphragm of the telephone receiver would in turn vibrate in accordance with the changes of strength thus brought about in the current flowing in the circuit and therefore, in correspondence with the vibration imparted to the receiving diaphragm.

If one some would speak into the receiving apparatus his voice would thus be transmitted at a distance without the need of intervening wires and through the influence of the light rays.

In order to clearly understand the functioning of sound recording and reproducing apparatuses, it is quite necessary to have a fair understanding of the fundamental principles of electricity and electro-magnetism.

Without attempting to enter into an elaborate discussion of electrical and magnetic phenomena we consider quite fitting to acquaint our readers with some of the terms which will appear in the course of these articles and their significance.

It is quite proper to mention here that when reference is made to the "flow" of an electric current, this expression should not be construed to indicate a natural advance or movement forward of the current, but it should be visualized in the sense that the current is the resultant of the motion of an innumerable number of infinitesimally small particles of electricity called "electrons." Some of these electrons are bound to the moleculae of the current conductor and some of them are free to roam around within the moleculae.

The motion or vibration or displacement, as we may call it, of the free electrons is surmised to consist of their discharge from moleculae to moleculae, or atom to atom, under the action of an electro-motive force.

The motion of the bound electrons is construed to be in the form of a temporary small displacement of the electron from its position of equilibrium when the electromotive force is acting upon it.

The "flow" of an electric current should then be construed not as the actual displacement of something tangible, such as water for example, but as a transmission of movement much in the same manner as we consider the motion of light as the vibration or motion imparted to a particle of ether by another vibrating particle just preceding it.

Whenever "something" is involved in a movement it is possessed with the power of accomplishing an effort which is termed "work." Whenever this "something" has the power to accomplish work it possesses what is called "energy."

"Energy" is termed Potential or Kinetic according if the "something" is immobile or in motion.

A weight, a book for example, or a stone, or a body of any sort, placed upon a table is in a condition of rest and it possesses potential energy. If this body is pushed to the edge of the table sufficiently far as to fall from it, at the very instant at which it begins to fall it acquires kinetic energy.

An electric current in a state of rest, such as when it is stored in a condenser or accumulator, possesses "electro-static energy" which is the electric term corresponding to mechanical potential energy.

If the electric current is in a state of motion, as for example, if it is flowing into a conductor,

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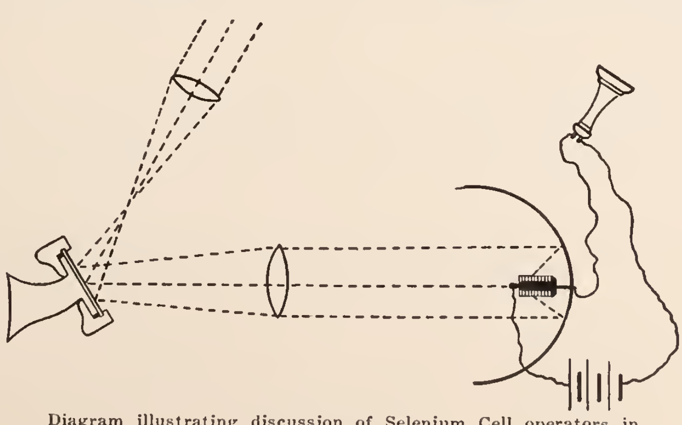

Diagram illustrating discussion of Selenium Cell operators in producing sound.

BELL & HOWELL

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No camera booth—and the "mike" ten feet away!

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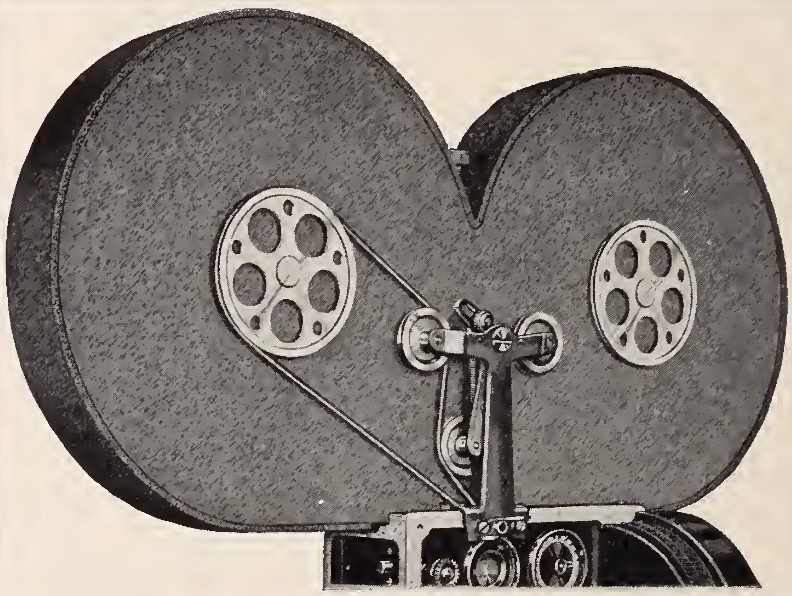

1000-foot sound-proof magazine with silent belt tension equalizer used on Bell & Howell Silent Standard Cameras

Silent fiber gears alternate with steel gears. Solid bronze and hardened steel bearings are used, tight yet free-running. Camera interior and shutter blades are sound-proofed with felt. Special magazines are sound-proofed through alterations in inner parts and outer sponge rubber covering. Film take-up is automatically controlled by silent belt tension equalizer.

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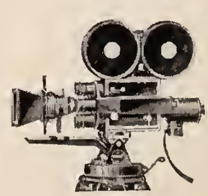

Some Properties of Fine-Grain Motion Picture Film Developers

A Paper Presented at the Spring Meeting of the Society of Motion Picture Engineers at New York City, May 6 to 9, 1929

By H. L. Carlton and J. I. Crabtree

[This paper, Communication No. 388 from the Kodak Research Laboratories, Rochester, N. Y., will be printed in two parts. The second part will appear in the August issue of the American Cinematographer.—Editor's Note.]

SINCE the publication of the Kodak fine-grain developer formula for motion picture film[1] many requests have been received for further details pertaining to its use, and for methods of altering its photographic characteristics. Experience has shown that the developer cannot be exhausted to the same degree as many developers which have been used previously because it is more sensitive to the retarding action of the products of development. Also a black sludge of metallic silver forms in the developer during its use, and with an exhausted developer an excess of sludge is present which tends to deposit on the negative.

The present work was undertaken in order to investigate:

(a) The useful life of the borax developer during which no appreciable loss in the speed of the emulsion is incurred.

(b) Methods for maintaining the rate of development constant for use in machine development.

(c) Methods for increasing or decreasing the rate of development to satisfy the requirements of the various film laboratories.

(d) Methods of obtaining finer-grained negatives.

I. METHODS OF MEASURING THE PHOTOGRAPHIC CHARACTERISTICS OF THE DEVELOPER

General methods of testing photographic developers have been described by one of the authors.[2] These general methods supplemented by those described below, were used.

(A) Method of Development

Development was carried out in exactly the same manner as recommended for the development of motion picture film by the rack and reel systems.[3] All the data on mixing, exhaustion, and revival were obtained from the use of a 120-gallon tank of developer employed in the routine way for commercial work.

A miniature duplicate of the commercial rack and tank apparatus was used for testing and exhausting the experimental developers. Glass battery jars holding one-half gallon of developer were kept at constant temperature by circulating tempered water around them. Small racks were used holding 50 inches of motion picture film and were constructed like the racks used in regular motion picture work. Checks were made at frequent intervals to insure conditions corresponding to those found in commercial practice.

A standard manipulative treatment was given in all cases as follows: The rack was agitated by lifting about two-thirds of the way out of the developer. To start the development, the lower cross bar was just dipped under the solution and then wiped under the solution with a general sweeping motion of the hand to remove air-bells.[4] The upper part of the rack was next immersed and the top cross bar wiped in the same way, the whole immersion procedure taking no more than five seconds. The rack was then gently moved with a circular motion in the developer, and agitated at the end of 45 seconds and again at the end of every minute until development was complete.

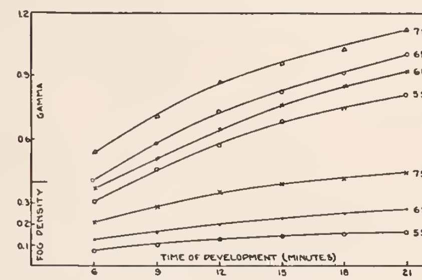

Fig. 2. Time-gamma and time-fog curves for borax developer at different temperatures. (Rack and Tank method).

(B) Sensitometry

Most of the sensitometric measurements were made with Eastman motion picture panchromatic negative film (type 2). One emulsion was chosen and used for the tests on the various developers so that all the tests were comparative.

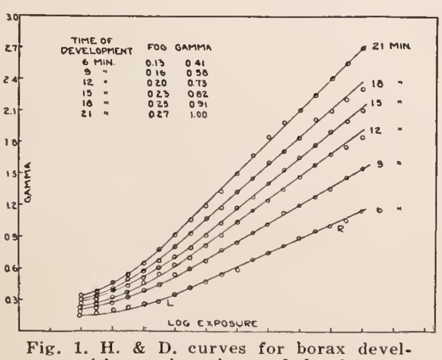

Fig. 1. H. & D. curves for borax developer with varying times of development at 65°F. (Rack and Tank method).

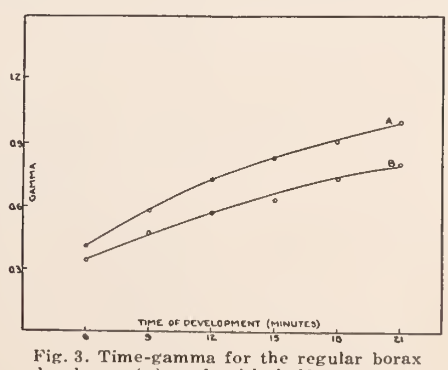

Fig. 3. Time-gamma for the regular borax developer (a) and with half concentration of borax and developing agents (b). Rack and tank method at 65°F.

The standard sensitometric method of Hurter and Driffield was employed. This method is described in detail by Jones and Crabtree.[5]

The sensitometer for making the standard exposures was similar to that described by Jones.[6] The exposures were produced by a single revolution of a sector wheel which gave nineteen exposures differing by the factor of the square root of two. The light source was an acetylene burner screened to noonday sun with a No. 79 Wratten filter.

In studying the characteristics of a developer, a series of strips exposed upon the sensitometer were developed for 6, 9, 12, 15, 18, and 21 minutes. When the characteristic H. & D. curves were plotted, a family of curves was obtained as shown in Fig. 1. These curves illustrate the effect, on the characteristics of the negative, of increasing the time of development. With increased time of development the densities in the highlights at R increase much faster than the shadows at L and give a corresponding increase in the density contrast of the negative.

Each of the curves has a straight line portion and the angle made at the intersection of this extended straight line with the exposure axis is a measure of the degree of development. This angle increases with the time of development. The tangent of this angle affords a numerical measure of the amount of development and is called the development factor or gamma.

In the lower exposure region which corresponds to the shadows at L, each of the curves deviates from the straight line and becomes more nearly parallel to the exposure axis. This portion of the curve is called the underexposure region of the characteristic curve in contrast to the straight line portion which is called the region of correct exposure. This underexposure region is often called the toe of the curve and extends up to the point where the density values begin to lie on a straight line. The shape of the toe is very important in reproduction because the extreme shadows in most normally exposed negatives and nearly all of the tones of an underexposed negative may fall on this portion of the curve.

The density contrast of the negative is the density difference between the extreme highlights and the extreme shadows and depends on both the brightness contrast of the subject and the degree of development. Although gamma and contrast of the negative do not have the same meaning, they are proportional when the exposure of the negative remains constant. Low gamma development gives a flat negative with low density contrast and high gamma gives a negative with high contrast.

(C) Fog Measurement

The fogging action of developers has been discussed by Crabtree[7] and by Dundon and Crabtree.[8] The fogging action varies greatly with the nature of the developer and is measured as the density of the deposit of an unexposed portion of the film, such as the area outside of the perforations on a strip of motion picture negative. Normal fog densities range from 0.10 to 0.25.

(D) Speed of Emulsion

It is customary to specify the speed or sensitivity of a photographic material in terms of the exposure value (inertia) where the straight-line portion of the H. & D. curve extended cuts the exposure axis.[5] This, however, is not a true indication of the relative density-giving power of the emulsion when exposed to light of different colors or wave-lengths. Methods of determining relative speeds to various portions of the spectrum have also been outlined previously.[5]

When discussing relative speed values, the cameraman is primarily concerned with the ability of an emulsion to render detail in the deep shadows with an underexposure. This property can be numerically evaluated for some emulsions by a study of the characteristic curve. A line is drawn through the plotted fog values and parallel to the exposure axis. The straight-line portion of the curve is then extended to cut this line and the exposure value at this intersection may be considered as a measure of the **speed** of the emulsion. For a faster film the exposure value is smaller so that the **reciprocal of the exposure value** gives a numerical value of the speed of the emulsion. This makes a fairly accurate method for numerically evaluating the shadow rendering power as long as a constant degree of development is used, and the straight-line portion of the curve extends down to density readings of 0.3 to 0.4. In other words, this method holds when the characteristic curve for the emulsion does not have a long underexposure region.

With some emulsions the toe of the curve is relatively long and rounded up to a density value of 1.0. In this case the projection of the straight-line portion above a density value of 1.0 is not an accurate measure of the speed of the emulsion. A method has been described by Jones and Russell[9] for evaluating the speed of such an emulsion in terms of the **minimum useful density gradient.** For this purpose the point is taken on the curve where the tangent has a value of 0.2 and the point of intersection of this tangent with the line drawn through the plotted fog value and parallel to the exposure axis is a measure of the speed of the emulsion. With emulsions which have long rounded toes, this method is far more indicative of the speed of the emulsion for the cameraman than the standard method outlined above.

The speed measurements made in this investigation were made with an emulsion which had a very short toe so that the speed measurements calculated from the inertia value were a fairly true measure of the speed of the emulsion for the cameraman.

II. PHOTOGRAPHIC CHARACTERISTICS OF THE FRESH BORAX DEVELOPER

(A) Characteristic H. & D. Curves

Typical H. & D. curves for Eastman motion picture panchromatic film (type 2) developed for varying times in the borax developer are shown in Fig. 1. When the exposures are within the limits on the exposure axis that correspond to the straight-line portion of the curve, correct reproduction is obtained. When a subject is underexposed, part of the exposures fall in the region of the toe and correct reproduction is not obtained.

Similar H. & D. tests were made with the MQ-80 tank developer[3] which has a much higher rate of development. The borax developer gave more emulsion speed for the higher degrees of development. For a low degree of development the curves were practically identical. The development of detail in the toe part of the curve with the MQ-80 developer is inhibited by the potassium bromide which is used to prevent the developer from giving excessive fog.

(B) Time-Gamma Curves

Examination of Fig. 1 shows that the extent of development or contrast of the negative increases with the time of development. This relation between the contrast and time of development, which is a fundamental characteristic of every negative developer, is recorded by plotting the time of development against the gamma. (The gamma is the tangent of the angle made by the intersection of the extension of the straight-line portion of the curve with the exposure axis). Fig. 2 gives time-gamma curves for four different temperatures including one above and two below the usual development temperature, 65°F.

The gamma value for a constant time of development is a measure of the rate of development. Examination of Fig. 2 shows that when developing for 15 minutes an increase in the temperature of the developer from 55°F. to 75°F. increases the rate of development indicated by a rise in gamma from 0.68 to 0.96.

The rate of development and the shape of the time-gamma curve depend upon the method of development used. A comparison was made of the relative rates of development with rack and tank, with reel, and with brush development. Brush development gives maximum agitation of the developer and removal of the oxidation products from the surface of the developer and approximates the rate of development obtained by machine methods. Results are given in Table I for the rate of development obtained by these three methods.

Table I

Effect of Agitation on Rate of Development

Treatment	6 Min. Gamma	9 Min. Gamma	12 Min. Gamma	15 Min. Gamma	18 Min. Gamma	21 Min. Gamma
Rack and Tank	0.41	0.58	0.65	0.83	0.91	1.00
Reel development....	0.54	0.77	0.95	1.03	1.11	1.20
Brush development	0.57	0.79	0.97	1.07	1.13	1.23

The brush and the reel methods give practically the same rate of development and correspond with the maximum agitation that can be produced under practical conditions. Over the range tested the rack method takes

Continued on Page 35

On Tinted Film

Continued from Page 6

visual sensation produced by the action on the retina of equal intensity of radiation of the various wave-lengths, as indicated by the abscissa values.

By judicious choice of dyes and dye mixtures which give spectral absorptions correctly adjusted with respect to the photo-electric response and to the retinal sensitivity, it has been found possible to produce a series of colors having hues distributed throughout the entire hue scale and at the same time having relatively low densities as measured with either the potassium or the caesium photo-electric cell-tungsten lamp (3000°K) combination.

As a preliminary to this work a careful spectrophotometric analysis showing the selective absorption characteristics of several hundred available dyes was made. It was soon found that it would be quite impossible to produce colors of the red, orange, yellow group without absorbing some of the radiation to which these photo-electric cells are most sensitive. The question then arose as to the absorption permissible in practice. There are really two phases to this particular problem, one involving a determination or decision as to the magnitude of photo-electric absorption for which satisfactory compensation can be made by increasing amplification without encountering serious electrical difficulties or sacrifice of quality in the reproduced sound. The other involves a consideration of the volume change which takes place in passing from one color to another when these are assembled consecutively in a reel of sound positive.

A large number of experiments were made in this laboratory to gather information upon which a rational decision relative to these points could be made. After having reached conclusions as to satisfactory values for maximum and minimum photo-electric density values, the matter was discussed with several authorities in the field of photographic sound production, communicating engineering, and acoustics. The opinions from these individuals correspond surprisingly well with those based upon our experimental results. There seems to be no difficulty encountered in increasing amplification to compensate a photo-electric density of 0.3. This photo-electric density can be looked upon as equivalent to a certain loss of volume which in turn can be expressed in terms of transmission units (decibels). In order to convert a density value, density being defined as the logarithm of the reciprocal of transmission, to equivalent decibels it is only necessary to multiply by 20. Thus, if an optical density of 0.3 (measured of course in terms of the photo-electric cell and tungsten lamp combination being used) be inserted between the exciting lamp and the photo-electric it will be necessary to increase the amplification by 6 decibels in order to obtain the same volume output. On commercial equipment the volume control is adjustable by steps, in some cases each step corresponding to 2 decibels, and in others to 3 decibels. Thus, the use of a

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A. S. C. Member Treed by Wild Buffalo in East African Jungle

Clyde DeVinna Writes a Few Interesting Lines from East Africa, Where He Is Photographing M-G-M's "Trader Horn." Headquarters at Nairobi.

By Clyde De Vinna, *A. S. C.*

A FELLOW never quite knows how lovely Hollywood is until he finds himself stuck away off in a place like this. Then when he is lying awake at night wondering if the mosquitoes will find their way through the netting around his cot, and wondering if there will ever be another breath of cool air for him—well, he just can't help thinking about Hollywood, the studios, the pretty flowers of California, and of the friends so far away.

Tonight I would give a great deal to be able to drop in at a meeting of the A. S. C. and chew the fat with the old gang. But instead I am wishing I had an electric fan here to help keep me cool while I am writing.

However, it's all in the game, and when we get back with our picture no doubt all of us will be darned glad we suffered with the heat, dirt and insects. After all, what we are all striving for is a better picture than ever before, and I think that is what we are going to have in "Trader Horn."

I thought that perhaps some of you would like to hear something about this neck of the woods and what we are doing, so here goes. We arrived down here in April—that is, our advance party. Came ahead of the gang in order to build a laboratory where we will do our own developing. After a lot of hard work that has been accomplished and we are set to go. A little later I might have some pictures of the laboratory and will send them along so you can see how we are doing it down here in the wilds of Africa.

Where to begin on the country is a problem. Nairobi is nothing to crow about as one's home town. In fact none of the towns would make a man want to ever return. But there are many people here who have lived here for years and seem to like it. They have all sorts of excellent liquor here, of course, but aside from that and the high prices of everything, there is not much to make the place stand out.

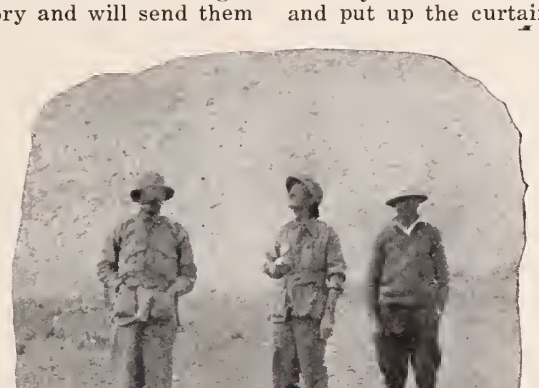
Up to this writing we have been dashing about the country seeking locations. Some are good and others are not worth writing home about. But we have found some that are wonderful and worth coming to get. Getting around down here is a tough job. The roads are nothing but dust when it is dry, and when it rains they are impassable.

On one trip up into the Kisumu country I ran into the hardest going since the Painted Desert trip I once took. When we reached Kisumu we found a hot, miserable little place on the edge of Lake Victoria, with almost no accommodations, but billions of mosquitoes.

The next day went in a launch to Crocodile Island where the "crocs" are supposed to hold their conventions. They were not convening that day. Only a dozen or so were there. But one, that I shot at and missed, was more than 25 feet in length. Six or eight Hippos were very curious about what we were doing there, and hung around a few hundred yards from the shore all the time, but we could only see their snoots as they came up for air.

Started home by auto the next afternoon. It began to rain and on one hill the mud was so bad it took us two hours to go three miles. Damnest mud I ever saw!

And then we hit a swarm of locusts so thick we couldn't see the road fifty feet ahead of the car, and so many in the sky that it looked like a cloudy day. We stopped and put up the curtains when we saw the swarm ahead, but even then they got in and we had a few thousand of them in, on, and around the car. A few miles further, after we had run out of the swarm, we stopped for the double purpose of refilling the radiator and picking the pesky things out of the machinery. A few natives were there getting water, and when they saw the locusts they made a run for the car and picked them off as fast as they could. Locusts are considered good eats by them—they dry 'em and fix 'em up some way or another. I wasn't interested;



Wa-Kamba Medicine Man and his "patients" are pic-tutred below. Photographed by Clyde DeVinna, A. S. C., in the Nzeeni district of East Africa. Above is DeVinna (center) watching a swarm of locusts pass by. The natives eat these insects.

but the natives certainly cleaned the car thoroughly—even picked the radiator perfectly clean of them. And it was chock full.

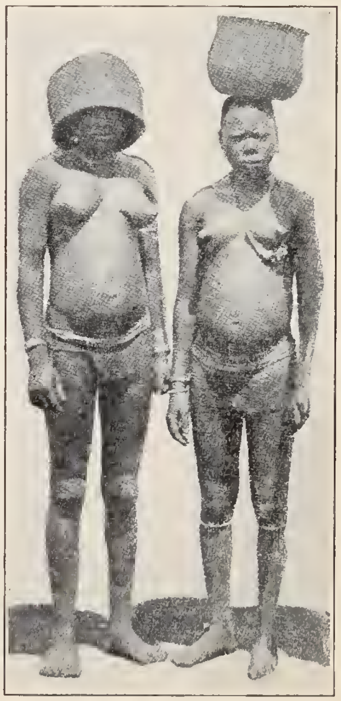
Came by another lake, about a mile from the road, and I noticed a pink fringe extending around the edge of the lake and reaching out quite a way into the wated. I made some remark about beautiful pond lilies, but a guide said they were birds—Flamingoes. I thought he was a liar, as I was sure I knew flowers from birds. But I put the glasses on them and the guide was right. There were millions of them.

Saw a troupe of baboons—stopped and fired into them just to frighten them. Succeeded. You should have seen them run. They stood about four feet high when standing erect. When we got back to Nairobi we spent nearly a day in the bath tub trying to get the dirt and dust washed off. Even the tubs here seemed heavenly after the tin buckets we had to use on the trip.

The next trip found us pitching camp in one of the African rains. If you think you ever saw it rain you haven't not until you stop here in a rain. But these black boys sure know their onions when it comes to making camp. They put up our tent and whether you believe it or not there was nothing wet in it or under it. Just as snug as a bug in a rug, we were.

Got our first taste of game on this trip. Ran across a herd of Impala and I was extremely lucky in bagging one at about 375 yards. Fresh steaks for supper. Good, too!

Went over in the Ngong district on another location hunt. I drove off alone until I came to the end of the trail. I left the car and walked some distance to look over what seemed like a fine spot. There I discovered a bunch of Colubu monkeys holding a circus or something like that. I stopped to watch them and was so intent on their affairs that I didn't notice the bellowing of something or other behind me for some time. Then I turned around finally and looked to see where the cows were.



Latest fashion news from Africa. The ladies invert the hat when it rains.

Imagine my chagrin when I discovered they were not cows, but three enormous buffalo. And boy, they are nasty birds down here. They hadn't seen me, however. There was a convenient tree nearby, so I quiety became part of the Colubu circus outfit and finally came to roost about fifteen feet from the ground in a nice, soft fork of the tree.

Luckily the wind was in the wrong direction and the buffalo did not discover I was around. They came down to the stream, took a drink and busted off through the brush. After I was sure they would not be back I climbed down and departed for camp. I had a 45 Colt with me, but fortunately, I did not think of shooting at them with it, for they tell me here that these bucalo are bad eggs when wounded and hunters are warned to use only heavy rifles that will stop them with the first bullet.

I have my radio set along and take it everywhere. As yet I have not been able to get through the air to California, but hope to get there before long.

Will send you a lot more dope on our doings later.

Olive Oil for now.

From Assistant Cameraman to Motion Picture Star

This Is the Story of George O'Brien, Fox Star. He Once Assisted Dan Clark, A. S. C., and Carried Cameras for the Tom Mix Unit.

By John Parker

IF GEORGE O'BRIEN hadn't believed everything that a motion picture star told him he would probably be just a hard-boiled sailor scrubbing decks or shining cabin doorknobs.

However, George had faith—and today he is riding the crest of the wave of popularity and success. All of which leads us to the point that it really was Tom Mix who "discovered" O'Brien.

George had come back from the World War with an "itching heel," as it were. He had left medical school to go into the navy, and when the war was over he didn't feel like going to school any more. So he wandered about San Francisco, his home town, for some time. One day Tom Mix came to town and was shooting a Western nearby. George used to go out and watch him. Tom finally noticed this youngster and took a liking to him. The day Tom left for Hollywood he bade George goodbye and told him if he ever decided to go into pictures to come to Hollywood and see him.

"I think you ought to make a good cameraman," said Mix, "So if you decide to become one, just look me up."

George played football a little later and was so banged up he had to go to the hospital. While lying there he decided it would be a good thing to be a cameraman.

A short time later Mix was driving in through the gate of the Fox Studio when he spied George standing there.

"Hello, George, what are you doing here?" asked Mix.

"Hello, Mr. Mix. I came down to accept your offer," and George smiled.

"Tom looked me over," explains George, "and with a rather long face explained that his own unit was pretty crowded but he would see what he could do with some other unit."

A few days later George was working in the camera department at the magnificent salary of fifteen dollars a week.

Dan Clark, A. S. C., and George O'Brien, Fox Star, show us how they looked in the days when George was Dan's assistant.

"And if you think living in Hollywood on fifteen dollars a week is easy, you are mistaken," declares O'Brien. "But it was wonderful, just the same, and I would not have missed it.

"I buckled in with all I had to make good. I carried cameras and did everything the cameraman told me. At night I went into the laboratory and delved into the mysteries of developing, with the thought ever in mind that I would become a cinematographer or 'bust.'

See if you can pick out George O'Brien, Fox Star, who was an assistant cameraman for the Tom Mix unit when this picture was made.

"The cameramen were really wonderful. They apparently liked me and gave me all the advice in the world, with the result that I eventually became a regular assistant and found myself being allowed sometimes to crank the camera myself.

"It was here that Dan Clark and I formed a remarkable friendship. Dan at that time was getting $25 a week. I was getting $15. Between us we didn't have so much. So we decided to get a room together at the Y. M. C. A. The room cost us eleven dollars a month. It had two army cots and one small rug. As the floor was concrete the rug was a nice thing in the morning when you stepped out of bed. We used to toss the rug agross the floor as soon as we had finished with it so the other fellow could use it to step on.

"Dan and I had one top-coat between us. And when I went out on a cool night and had announced my going early, I wore the coat and Dan stayed home or was cold. We shared the neckties the same way. When we both had to go out the same night one wore the coat, the other the good necktie.

"Finally, Dan and I were both working with the Mix unit and then things perked up for us in the food line. Mix always took a 'chuck' wagon on location each day. Dan and I would eat a tremendous meal at noon from the wagon, which was free. Then we only needed a light supper which saved money. But those were wonderful days, and Dan and I used to solve all the problems of the picture game some evenings.

"Lewis Milestone used to come up and get a free bed at our room now and then when one of us was out, for Lewis was up against the problem of living. So was Richard Wallace, who was cutting pictures then. We all talked the things over and wondered what it was all about many times.

"Then, at the end of two years, Fox gave me a raise of five dollars a week. It took the combined efforts of Mix and a half dozen others of importance to get the raise through. I was getting $20 a week!

"An opportunity came to go to another studio at $35, so I took it. At the end of the third week the company went broke and I was out of a job. Then the old fifteen a week would have looked good. But I would not go back to Fox again.

"After a while I decided that I would not make a good cameraman, anyway. All the time I had been working I had been watching the actors and directors, and my heart lay in that direction. So I suddenly packed up and went back to Frisco, intending to go to sea. In fact I had signed on with a ship when I ran into Hobart Bosworth in Frisco. He asked me what I was doing. I told him I was going to sea. He said he needed some men to play the part of sailors, so I withdrew from the ship and became an extra in Bosworth's outfit. That was the turning point for me.

"George Melford came up there shortly afterward and I got a job with him. And then I had to come to Hollywood to finish the interiors. I was getting $75 a week. Imagine!

"Well, from then on I was determined to be an actor. But there were times when I wondered if it would ever pay me to spend the best part of my life wandering around Hollywood waiting for a job. Jobs came here and there as extra, and finally I became a $25-a-day man doing bits and small parts that required riding and athletic ability.

"Skipping over a long time I go to the time when Fox was looking for a man to play in the "U. P." trail. You know, "The Iron Horse." I had been up for another big part before, but after they decided I would be fine they turned me down because I had no name. So I did not think much about it when Fox gave me a test this time.

"Weeks went by and I did not hear from Ford, the director, or from anyone at Fox. Frank Lloyd was making a picture and I had the chance to sign on as a galley slave. So I went to Fox's officials and asked what to do. They said to go on with Lloyd. I signed up and was about to start work when I received a frantic series of calls from about everyone at the Fox Studio. I had been given the part.

"You know the rest of the story. No need to tell any more."

He was right, for who doesn't know about O'Brien and his work of recent years?

But George through it all has not forgotten the days when he lugged a camera around on his shoulder for his boss cameraman. He never will forget those days or those cameramen.

"They are a wonderful group of men, these cameramen," declared George when talking about the old days. "Hearts as big as mountains and always ready to help everyone. And artists—they are magnificent artists and get all too little credit for their artistry. Where would lots of us be if it were not for the magnificent artistry of these men who hide their light under a bushel and leave the glory to the rest of us!"

Richard Eichberg, a German producer, has arranged to use the Stille process for the sound part of his next production. This message from Berlin is evidence of the interest aroused by the "Sound on Wire" process.

NEW COLOR

with

EASTMAN SONO

ROSE DOREE—A rose pink that quickens the respiration. The tint of passionate love, excitement, abandon, fête days, carnivals, heavily sensuous surroundings.

PEACHBLOW—*Allegretto vivace.* A tint for brief, joyous moments, buoying up scenes of light, sensuous content. The spirit of coquetry. An excellent tint for close-ups.

AFTERGLOW—Less radiant than Peachblow, yet warm and stimulating. Café, banquet scenes, gardens, sunsets, late autumn.

FIRELIGHT—A cheerful orange tint—in interiors suggestive of warmth, intimacy, comfort. A mellow autumnal light.

CANDLEFLAME—In the middle tempos, but blending happily with all active moods. For general use in interiors. For exteriors morning and afternoon, with but little sky area.

SUNSHINE—The generous brilliancy of mid-day sunlight. Of use where the light of the sun plays prominently in fixing the locale or the mood . . . sunlight streaming through windows, Mexican patios, the desert.

VERDANTE—In the *larghetto* range. Refreshing. The sunny green of vegetation in spring and early summer. Simply furnished interiors.

AQUAGREEN—Emotionally cool, soothing, relaxing. Especially suited to water scenes outside the tropics. One of the wettest colors imaginable.

A Complete Gamut of Colors

SIXTEEN expressive tints — new to the screen, embracing the entire color spectrum, rich and varied in their emotional effects — comprise the new series of Eastman tinted base films known as Sonochrome.

Eastman Sonochrome provides a relief from the black and white of the present sound film and a wider range of expressive hues than the motion picture ever before possessed!

In hue and atmospheric quality Eastman Sonochrome can closely simulate the actual lighting of any exterior or interior scene. Lighting of realistic color content is a primary emotional source to which the motion picture never before has had such free access.

Sonochrome colors have definite affective values. Some excite, some tranquilize, some repress. Properly used, they enhance the moods of the screen and aid the powers of reproductive imagination in the observer, without making a distinct impression on the consciousness.

In Sonochrome, the maker of motion pictures will find an efficient and highly refined instrument for achieving dramatic effects, and the audience a new emotional experience.

MOODS FOR THE SCREEN

[SON]OCHROME FILM

The First for Sound Pictures

PREVIOUS attempts to use color on sound film have resulted in cutting off the light that excites the photoelectric cell, so interfering with the reproduction of sound. With the new Sonochrome tints this difficulty has been overcome, for they are so adjusted as to position in the spectrum that they do not blind the photoelectric eye.

The light to which the photoelectric cell responds passes freely through Sonochrome film, and the response is uniform over the entire gamut of tints.

For this reason Sonochrome tints, including the hueless argent substitute for clear positive, may be used in any sequence, permitting absolute freedom in the shifting of moods, without affecting the sound.

The Eastman Sonochrome tinted films are available at no greater cost than the regular clear base positive film.

Eastman Kodak Company, Rochester, N. Y., will gladly send you further information about

EASTMAN SONOCHROME FILM

TURQUOISE—With the liquid characteristics of Aquagreen, but cooler . . . the Mediterranean, the cool of dawn, bright moonlight.

AZURE—The tint of reserve and distance. In exteriors spacious, atmospheric—the blue of tropical skies. In interiors cold, formal, repressive.

NOCTURNE—For night effects, murky interiors. Maximum repression. The color mood of sadness, defeated expectation, dark intrigue, the underworld.

PURPLEHAZE—Rising somewhat in pitch from Nocturne. For dim interiors and outdoor settings obscured with haze. Languorous, dreamy, narcotic.

FLEUR DE LIS—*Tempo di marcia pomposo.* The time-honored hue of the ceremonial, the ritualistic. Pompous, solemn, stately. The purple of royalty.

AMARANTH—A less austere purple than Fleur de lis. Suggestive of gentility, aristocracy. Heightening the elegance and luxury of certain interiors. Balcony scenes at night illuminated from within.

CAPRICE—In the range of rapid tempos. An audacious magenta. The mood of fickleness, impulsive action, rash adventure.

INFERNO—*Agitato.* Intensely stirring with strong sounds and movements . . . fiery revolt, riot, conflagration, disaster, unrestrained passion.

ARGENT—A silvery hueless tone, less harsh than that of ordinary black and white positive. Of general utility for all untinted scenes.

A. B. C. of Sound Pictures

Continued from Page 15

it possesses "electro-kinetic energy." A certain loss of energy is always present in all electrical systems due to the conversion of part of it in heat energy and of part of it in electro-magnetic radiations, the latter being assumed to be due to the fact that some of the electrons discharged from moleculae to moleculae assume sufficient velocity to escape from the conductor, and to form a sort of electric envelope around the conductor, or better, around the current it self.

These losses of energy are referred to in terms of "resistance" and measured in ohms, which is the unit of resistance thus named from G. S. Ohm, who promulgated the laws of resistivity of conductors.

The resistivity of any conductor depends upon the material of which it is made; in other words, upon its conductivity, its size, or better, its section, and upon its length or shape.

It has been said above, that part of the loss of energy is due to electro-magnetic radiations. These radiations form a magnetic field which surrounds the conductor, or better, surrounds the electric current which flows through it.

The intensity of the magnetic field is proportional to that of the current and its flow is characterized by two motions, one around and the other in the same direction as the current.

An electric current may flow continuously in one direction, or may at equal periods, alternatively reverse its directions. In the first case the current is called "direct current," and for brevity "D. C."; and in the second case it is called "alternating current," or "A. C."

The magnetic field follows the direction of the current and, therefore, in the case of alternating current it reverses its direction in accordance with the periodical reversal of the current itself.

It is characteristic of the two currents that D. C. flows only in conductors, while A. C. flows also in insulators.

If two metallic plates, close to each other and separated by an insulator, be this air, glass, or other non-conducting material, are inserted in a circuit comprising a battery, producing a supply of electro-motive force, a momentary flow of current takes place in the circuit and negative electricity is accumulated on the interior face of the plate on the farther side of the insulator and reacts upon the positive electricity equally distributed on the two faces of the other plate which we will call the **first plate** as being the one first reached by the flow of current. This positive electricity is accumulated by this reaction on the inner face of the first plate. The exterior face of this plate can, therefore, receive another supply of electricity from the battery.

This supplementary supply goes through the same process, as just explained, that is to say, negative electricity is again accumulated on the inner face of the second plate across the insulator, positive electricity is again accumulated on the inner face of the first plate and the outer face of this plate is again ready to receive a fresh supply of electricity. This process goes on until an equilibrium is established between the charge of the outer face of the first plate and the electric pressure from the battery.

In electrical terms the flow of current ceases as soon as the "potential difference" of the medium is equal to the "electro-motive force" of the battery.

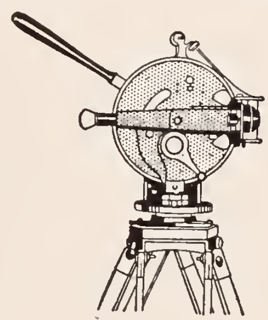
The apparatus consisting of the two plates separated by an insulator is called "a condenser." The insulator is called the "dielectric."

Large quantities of electro-static energy can be accumulated on the surface of a condenser.

The capacity of the condenser, that is to say, its ability to accumulate electro-static energy, is dependent upon the size of the plates, their distance apart, and the nature of the dielectric.

If the capacity of the condenser is overtaxed a spark will pass between the two plates and the dielectric will break. The condenser is then said to be punctured.

(To Be Continued)



Academy to Make Survey

A survey of motion picture sound production problems in all the larger Hollywood Studios is now being made under the auspices of the Academy of Motion Picture Arts and Sciences.

The survey is preparatory to a projected series of investigations and tests to present the basic methods for problems common to all studios. Cooperating with the Academy are the technical bureau of the Association of Motion Picture Producers; R. C. A., and the Electrical Research Products, Inc.

The projection is planned along the same lines as the inquiry into incandescent lighting which was conducted by the A. S. C. and the Academy last year.

A. S. C. Member Heads Victor Studio Cinematographers

Frank Zucker, A. S. C., has been appointed chief cinematographer at the Victor Phonograph Studio, Camden, N. J. Mr. Zucker has long been one of the outstanding cinematographers of the industry, and is president of the Cameramen's Union, Local 644 in the East.

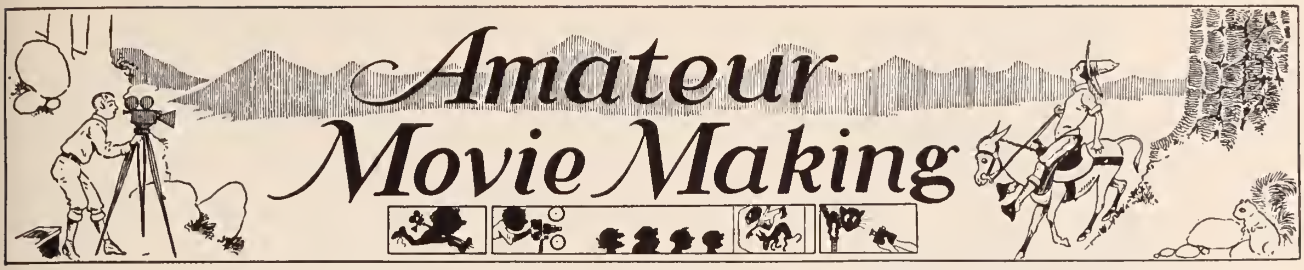
Filmo Duplicator

Many amusing effects may be obtained with a simple, inexpensive accessory known as the Filmo Duplicator. This unit consists of a prism of optical glass, mounted so that it may be easily placed over the universal or focusing mount 1″ F 3.5 Filmo 70 or 20 mm. F 3.5 Filmo 75 lens in place of the sunshade. A subject filmed through the Duplicator is shown as a double image upon the film. A man playing golf, runnin, or walking would have a double. A horse jumping would appear as two horses jumping. Many comedy tricks can be devised by the amateur and incorporated into his film productions with this new device.

Crystal Mirror Surface Screen for Kodacolor

The Crystal Mirror Surface Screen is another new development which contributes to the perfection of Kodacolor pictures. Its surface is remarkably high in reflective power, and is of the finest texture. These qualities are essential to the best Kodacolor results.

These new screens are of the rigid frame type, giving a permanent flat projection surface. The frame is of neat wood moulding, finished in a light walnut brown. Pivoting feet are supplied for supporting the screen, as shown in the accompanying illustration. Three sizes are available: 16½x22 inches, 24x32 inches, and 30x42 inches.



Avoid Past Mistakes

WITH summer here again, and a new season's activity staring us in the face, a really helpful plan for most amateurs would be to make out a list of the particular faults which have so far afflicted their work, and paste it conspicuously in their camera-cases. None of us are without some faults; all of us want to overcome them. But improvement is not to be had by the mere desire, nor by merely looking over past work and promptly forgetting the lessons therein embodied. Saying "Dammit, I always do **that** wrong!" in the projection-room doesn't help much unless **that** is kept in mind the next time the camera is used.

Anyone can make mistakes—but why make the same mistake twice if it can be avoided by a little care? Now the first step in avoiding such mistakes is remembering them when shooting; and, most memories being what they are, a handy list is really helpful. It may be embarrassing to be confronted with such a list in that important moment just before shooting a scene—but it's the best medicine in the world for ailing technique!

Of course everyone has his own particular troubles, but here are a few that will be good ones to start any list with. First—cutting scenes too short. Everyone does it; the seconds seem so much longer when you're pressing a camera-button than they do when you're watching the result on the screen. If anything, a scene is better too long than too short, for you can always trim down a long one—but what can you do with an over-short one?

Naturally, this involves using more film, but it eventually means a great saving, for there will be less lost footage from inadequately timed scenes and discarded sequences. One of the most bewildering practices of professional production is the apparently reckless expenditure of film, in every sequence thousands of feet are shot over and above what the script calls for; close-ups, medium-shots, long-shots, angle-shots—every conceivable variation is tried lest later it be needed and the whole company be recalled just to make it. Obviously the cost of the extra film thus used is nothing compared to the staggering cost of recalling a whole company, the operating cost of which may be several hundred dollars **a minute**, for one or two small scenes. Of course, no amateur need follow that practice literally, but all should bear in mind the principle. Although film is expensive, the little trimmed out of an over-long scene is far less costly than the whole of an over-short one thrown away. Thus it is far the wiser plan to time each scene **at least** ten seconds—fifteen is better—carefully and **slowly** counting the while. At that it is little enough—only fifteen feet standard, or 7½ feet 16 mm. Even 'flashes' are best made comfortably long, for they can always be trimmed down, but never lengthened.

Keep Cameras Clean

Another item for most lists is keeping cameras and projectors clean and well-oiled. We ask so much of the poor things that we ought to at least give them this much in return. The amount of care given a camera is one of the surest ways to differentiate the truly fine craftsman from the ordinary worker. As a rule, the better the worker, the better his camera; and the instruments of most professional cinematographers are as immaculate as a West Pointer on dress parade. With them it is a matter of business and a matetr of pride; on their cameras depend their living and their professional reputations; therefore it is vital that they be always kept in perfect condition.

Though the amateur does not depend for his livelihood on his camera and the quality of work it turns out, his artistic reputation and personal satisfaction do depend on it. Therefore it is just as much to his advantage to keep his outfit perpetually at its best as it is to the professional's. Fortunately, in most amateur outfits the matter of maintenance is simplified to the minimum; the whole is as simple as possible, and the more delicate parts are carefully tucked away in a fairly dust-proof case. But the exposed parts—the various agents used to actually move the film—should be kept clean, and the inside of the camera-box itself should be kept free from the tiny shreds of celluloid, bits of dust, etc., that invariably accumulate there. The parts that require oil should be oiled regularly, but sparingly; too much oil is almost as bad as too little.

Finally, the lenses should be protected and kept clean. This is important. A single speck of dust doesn't matter so much, but when there are many of them they form a film over the lens surface that at least cuts down the brilliance of the image, and sometimes even affects the optical corrections of the lens. But be careful how you clean your lens! Only the very softest cloth, or, better, special lens-tissue, should be used, lest the delicate surfaces be scratched. Silk, though it appears soft and smooth, should never be used, nor should patent 'lens-liquids.'

When not in use, lenses should be kept covered, and always shielded from the direct rays of the sun, which seriously injure the polish, and sometimes even the cement between the elements of a compound lens. A leaf might well be taken from the professional's book—always keep spare lenses carefully capped, and wrapped in a soft cloth. If possible, have a special case devoted exclusively to lenses and filters. It saves them many hard knocks, and besides prolonging their usefulness generally, has the added advantage of keeping them always together.

And filters—don't handle them any more than necessary. Keep them even better shielded from the sun than lenses, and above all, don't forget that even the best filters have only a definite lifetime; don't try to stretch it too long. The filters generally used by amateurs are classed as 'fairly stable,' but even they deteriorate to some extent, and should be replaced occasionally. Professional cameramen, who have to carry a very extensive assortment of filters, generally replace them every few months, as a measure of precaution. While amateurs are hardly expected to follow suit, they should not, if they value the quality of their work, be too 'Scotch' in the matter. It doesn't pay.

Plan Your Shots

As a third item for the list comes one which might well go first: always be absolutely certain **what** you are going to shoot and **how** you propose to shoot it **before** you start.

Of course, except when producing a photoplay, most amateurs

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Better Modelling Lights

Continued from Page 7

beam a dark center by intercepting the light from the middle of the parabolic reflector. The divergence of the light from each element of the reflector is, however, enough to fill out the beam completely as soon as one is only a few feet from the unit.

It will be observed that the mirror is operated close to the lamp so that for a minimum diameter a maximum angle of light may be intercepted. This makes it necessary to hold the mirror on a hinged support so that it may be swung down out of the way when the lamp is renewed. The hinge should have a stop so that the mirror always returns to the same position. When the unit is initially assembled, care should be taken to adjust the mirror so that the image of the source is of the same size and is meshed in between actual coils of the source, as is shown in Fig. 4. This adjustment can be observed by looking

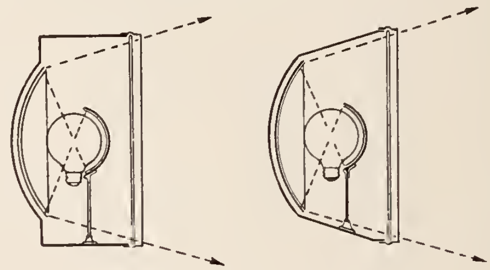


Fig. 6- Good design for reflector spots

at the two images of the filament of an unlighted lamp appearing in the parabolic reflector.

When a mirror spot is equipped with a long cylindrical barrel, the barrel will intercept and waste much of the light when the beam is spread. This is apparent from Fig. 5. The better practice is to use either a short barrel, or a longer one increasing in diameter, Fig. 6.

These, in brief, are the features to be watched in designing or purchasing modelling equipments. It pays to use the right kind, for they are more efficient, and thus save lighting costs; and they give improved lighting, which means better photography.

France

A new process for the manufacturing of color film was presented recently at the French Academy of Sciences by Professor d'Arsonval. It consists of a polychrome screen with which more exact colors and greater luminosity are obtained than with the trichrome screen system. This process, invented by M. Nordmann, further perfects the Berton invention. It is stated that the pictures projected by Professor d'Arsonval showed a brightness of colors which astounded the audience.

INFORMATION FOR AMATEURS

Amateurs—Send your problems to this department and have them solved by the world's finest cinematographers—the members of the A. S. C. This is your department. Our aim is SERVICE. Write us and find your answers here.

Question from L. R. S., Salt Lake City: How can I get the effect of partially diffused edges that I see in so much of the professional camerawork?

Ans.: Professional cinematographers get this effect by careful control of lighting, and by the use of gauze mats placed in front of the lens, in special holders. While there are no regular mat-boxes now made for amateur use, there are several holders made for the square glass color and effect filters; the amateur can easily use one of these for his mat-box, and making his own gauzes secure an almost unlimited range of effects. The gauzes should be mounted on a square frame of cardboard or heavy celluloid (the top of a cigarette-box is handy for this) and the desired opening in the center carefully burned out with a cigarette to whatever shape and size may be needed. An assortment of such gauzes of various textures, with and without holes, is a most useful accessory to any kind of cinematography.

Question from P. H., Oakland, Calif.: Is there any way to get the effect of reversed action with my Cine-Kodak, which has no reverse mechanism?

Ans.: The simplest way is to turn your camera upside-down and shoot your scene that way. When the film comes back from the laboratory, cut out the scene and re-splice it in with the rest so that it is 'heads up' with the other scenes; on the screen, the action is reversed.

Question from M. L. S., New York City: I make my own titles on 16mm. negative film, and the whites photograph as gray, and the blacks are not black enough. How can I get better contrast?

Ans.: Apparently you are doing your own developing. If so we recommend that you use a very contrasty developer—say Hydroquinone or M-Q—and then expose so that a very long, full development gives a dense black. If the type still grays over, a very brief treatment with Farmer's reducer will brighten it.

Question from R. G., Pittsburgh, Pa.: Is there any 35 mm. reversal film on the market?

Ans.: We do not believe so. However, a few years ago the Agfa A. G. had such a film on the German market, and may still make it. We suggest getting in touch with the Agfa-Ansco Corp., Binghampton, N. Y. It is possible, in an emergency, to reverse ordinary negative film, but the results are not perfect, and it is not recommended.

Question from R. H. S., Kansas City: What light condition is best for the making of Kodacolor pictures?

Ans.: The best Kodacolor pictures are made when the light is so bright that the normal exposure would be between f.11 and f.8. If the light is so bright that the aperture for normal exposure is about f.16 a neutral density filter should be used. A Cinophot or Dremophot exposure meter is of great aid in determining the condition of the light and whether it calls for the neutral density filter or not.

Question from R. B., Los Angeles: Can an amateur use the Technicolor Process in making 16mm. pictures? If so, where can I write for further information?

Ans.: Technicolor Process is purely a professional one devoted solely to the professional field. Special cameras using 35mm. film are used, and have to be rented from the Technicolor company.

Question from J. D., New York City: Is there a way by which I can make slow movies with a 16mm. camera?

Ans.: The Victor Animatograph Company, Davenport, Iowa, has just announced a new Cine-Camera that can be used for slow motion picture making on the same film —size 16mm.

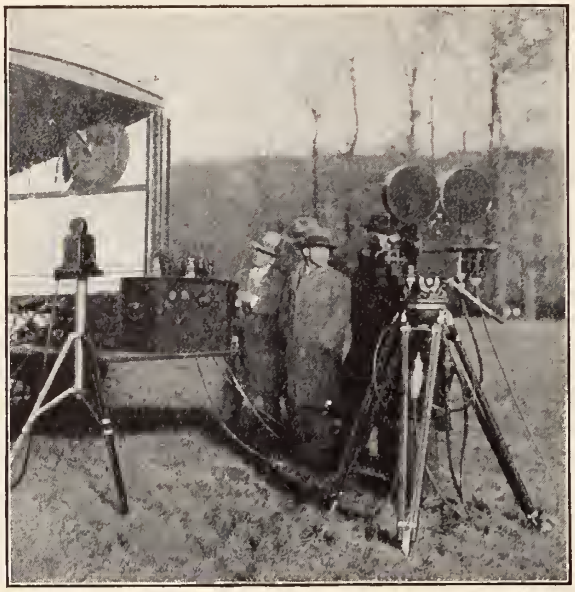
Is Your Filmo Registered?

For several reasons it is to your advantage that your Filmo Camera and Projector be registered with the Bell & Howell Company under your name and by the correct serial numbers. First, this entitles you to the protection of the two-year B. & H. guarantee. Second, it aids in recovering and returning your equipment should it become lost or stolen. Third, it makes available for you the benefits of the B. & H. Personal and Technical Service Departments.

If you have recently purchased a new camera or projector, or sold or exchanged your previous equipment, please give us the details so that all the units involved may be fully registered.

What a Difference a Filter Makes!

ABOVE are two photographs of the same scene. The one at the right, with the beautiful cloud, was made with an Optochrome-Ramstein color filter. The one at the left was made without a filter. The pictures speak for themselves and for the filter. Burleigh Brooks, of New York City, are sole agents for the United States and Canada for these filters. A Simplex Filter Set is gaining much favor throughout the country and are almost indispensable to the serious worker, amateur or professional. No gelatine is used in these filters, but they are made of a special pure optical glass.



This illustration shows the Akeley Gyro Tripod in actual use by the Western Electric Company, taking sound moving pictures.

Again AKELEY

. . . anticipated necessity

with a tripod ideal for Sound Pictures

"GIVE us the best camera tripod that human ingenuity can devise!" This was the demand of the sound cinematographers.

It was characteristic of the Akeley Company that its research laboratories had already anticipated this demand and were putting on the market such a tripod—a tripod quiet in operation, capable of great speed and flexibility, vibrationless but light, staunch yet easy to manage.

The Akeley Universal Gyro Tripod, containing the famous gyro mechanism, stands today a leader in this latest field of photography. This tripod is in constant use in many leading motion picture studios making Sound Pictures. These studios include Metro-Goldwyn-Mayer, Fox-Case Movietone, Pathe and Paramount. Other world wide corporations, such as Radio Corporation of America, Westinghouse Manufacturing Company, Western Electric Company and General Electric Company are enthusiastic users of the Akeley Gyro Tripod in their important work. We invite you to write for full description of this Tripod and details of our deferred payment plan.

AKELEY CAMERA INC.

175 Varick Street New York City

The Akeley Universal Gyro Tripod

Making Matte Shots

Some of the Intricacies of Making Things Seem What They Are Not—Explained for the Amateur by an Expert with Years of Experience.

By Fred W. Sersen
Chief of Art Department, Wm. Fox Studios

Writing this article is rather an unusual way of of expressing my thoughts, as I have seen used to doing so by means of paint and brushes for the last twenty years, and juggling the pen is somewhat clumsy. The editor of this magazine asked me to write something about "matte shots" as we call them in this studio, and I will try to describe the process of making them and how they can be used to best advantage.

Fred W. Sersen

Some will say "we have 'glass shots' and 'miniatures,' why use matte shots at all?" There are times when either one would do and again there are cases when some process will do better than others. I will enumerate some instances when the matte shots can be used to better advantage than anything else.

Sometimes the sets are not exactly as they should be, due to many reasons — incidents that come up daily—such as changing the script at the last minute, or the director may have some idea of his which came to him on the spur of the moment. Or the cameraman may see better composition if he shoots the set from a different angle, due to change of light or some other unforeseen reason, or to create a beautiful scene where one did not exist.

The use of a matte enables a cameraman to make the picture he visualizes. He is no longer limited by the size of the set, poor light, etc. It makes it possible for him to create and carry out the ideas he has for the enrichment of the production. I have seen cameramen by the use of ingenuity and mattes double the value of a production.

For instance: A company went to Nevada to photograph some battle scenes in a snow storm. To build the sets there would have been very costly, while without them the desired Russian atmosphere could hardly be obtained. (It happened to be a Russian picture). While they were walking around looking for the most suitable locations, they happened to run across an old concrete dam. The cameraman, being of a highly creative mind, began to visualize an old fortress connected with that wall of concrete, and before long he had a matte cut out of a piece of card-board and placed in the matte box so as to block out that piece of scenery where the fortress was supposed to be. The scene was photographed and was finished in the studio very successfully showing a fortress of great production value.

In cases of this kind it is necessary for the cameraman to be able to visualize the complete scene so as to be able to make a matte in the right place and provide enough space for the object to be painted in. He has to use good judgment as to how sharp a matte to make. If

Left is portion of set built at the studio in which the player moves. Right is landscape painted by artist and put in by matting out portion of first shot and the double-exposing it in. Above is the result of the efforts of the artist and cinematographer.

there are definite lines in the picture it is easier for an artist to match to the sharp lines and it is best for the matte to be placed about thirty inches from the camera, even further if the glass or the material to be used for the matte is easy to obtain. Again when matting to the footage (especially when there is any wind blowing) or when dust is created by action in the scene, in a rain or snow storm, very soft blend is desirable and the matte should be placed four to six inches from the lens.

It is a difficult thing to make a good combination shot of rain, snow or dust storm with a glass or miniature, because of the distance between the real set being so much greater than that between the glass or miniature and the camera. In this case the matte shot is much the best. By double exposing or double printing the rain or whatever it may be, all over the film, makes it a perfect shot.

In combination shots where the mechanism of the miniature is too complicated, or if there are any other reasons that might delay the company while shooting, mattes are the most plausible remedy.

The process is very practical—when putting two or three exposures together, by matting out the undesirable portion of the picture one can double expose or double print anything right on the original negative, which eliminates the process of duping which means much to the quality of the film.

In practice the cameraman conceives the effects or settings he desires and directs his camera as if the scene existed. By using opaque paint or glass or snipping out a piece of black cardboard and placing it in a rigid position between the subject and the lens those portions of the scene are blocked out so that the film is unexposed in those parts to permit the subsequent exposure of the painting. The camera is "planted" to prevent further movement, and a test scene is made as nearly under the same lighting conditions as is possible. Then the actual scenes are made, a record being kept of the footage, fade-outs, etc.

The test film, of which we usually have about one hundred feet, and the scene itself is turned over to the artist undeveloped. We take a few feet of the test and develop it, and this is used for lining up. There are several methods that can be used for lining up a "matte shot."

One can project the film through a camera on to a highly colored surface on which the artist is going to paint, and draw the outlines of the objects of the first exposure, which gave the base to draw to. After the drawing is completed, it is laid in with oil paint in black and white, and on the artist's ability and experiences depends the matching of the tones of the first exposure, which is ascertained by making the hand test and comparing the tones. He does this repeatedly by correcting the painting until the match is perfect. Another system is to line up the shot by using auxiliary aperture and

looking through it to guide the drawing of the picture.

The third method is to double expose over the original exposure a black screen divided by white lines into one inch squares which are duplicated on the surface of the would-be painting, and the image of the original exposure is transferred by aid of these squares. It is the same system that is used by artists in enlarging a drawing. In all cases enlargements of 9x12 inches should be made in order to better see the details of the picture.

The system we are using in this studio and which is most practical in about seventy-five per cent of "Matte Shots" is to make an enlargement of the picture on the paper which is mounted on a specially prepared board. This gives the artist a perfect picture of the scene and he can work out his drawing, tones and composition and see the picture as a whole before he paints his reverse matte on. It eliminates a long and tedious job of lining up, which is connected with the methods previously mentioned. One can appreciate the advantages of this system better when there are numerous objects to match to a very accurate printing. To demonstrate this, I would describe a shot I made of changing Michigan Avenue in Chicago from a day to a night shot.

We took a day shot of Michigan Avenue with automobiles and pedestrians in busy commotion as only American thoroughfares can be, and had an enlargement made of it. I painted the enlargement of the day shot into a night effect and the match was so perfect that in a four-foot lap dissolve one could not detect any variation in form whatever. It was a rather complicated shot and here is the process we used. Day shot was duped with four-foot laid out. Into that we lap the painting of the city at night, and the automobile traffic was double printed in by using positive of a film we photographed

At left is section of ship built on stage and matted out by cameraman. At right is portion of ship painted by the art department. Above is the finished product after the cameraman and artist combined their efforts in a triple exposure.

on the local street which was exactly the same width and same elevation as in the day shot. The shot had to be photographed at dusk when the head-lights of the automobiles were on. The pedestrians on the side walk were printed in from the day shot as well as the lower part of the first stories of the buildings, with automobiles parked against the curb. Only those acquainted with this type of work can fully understand what it takes to balance the lighting and painting of these separate parts of a picture and what perfect mattes had to be used in printing hard edges of the automobile contours.

The enlargement comes handy when we have three or more exposures to be put into one picture. By making separate enlargements on the same piece of enlarging paper will give us perfect outlines to the mattes which are used for double printing as well as the connecting painting which is double exposed in. For instance, we had part of a boat built for the action of people moving about on deck which was backed up by painted backing. This was to be made into a picture of the boat cutting through ice in the Arctic sea, with the clouds passing by. We built the hull of the boat in miniature which matched the set boat built for the scene, and photographed it with speed camera, the miniature ice floating by. This was double printed into the original take, and painted to connect the two, and the rigging was doubly exposed afterwards. The real clouds were photographed moving in the proper direction, aided by panning the camera, and then double printed in, which required some fine matting.

Too much attention cannot be paid to the steadiness of the exposure, as the least movement in the film will cause a distinct movement between two exposures. The films should be measured so the perforations would be perfectly cut into the film when intended for matte shots, and the camera buckled down securely.

All the work should be done through a camera fastened to a title block fastened to a concrete pedestal.

New Kodascope Rapid Splicer and Rewind Ready

The new Kodascope Rapid Splicer and Rewind, pronounced by experts to be one of the most complete and efficient instruments of its kind ever produced, is now on the market.

The new Rapid Splicer and Rewind is, in appearance, similar to the Kodascope Rewind, except that it is considerably longer and is equipped with geared rewinds at the ends. In the center is affixed the splicing device.

The splicer is semi-automatic. With a single movement of the cutter bar, both ends of the films to be spliced are accurately cut. The end of the film is then moistened, and an ingenious scraping device passed backward and forward across one of the film ends. This thoroughly scrapes just the proper area of emulsion from the film, and lays bare the film base, ready for the cement. After the cement is applied, one movement of the right-hand portion of the splicer brings the film-ends together and an instant's pressure on the sealing device then distributes just the proper weight to insure a firm, perfectly aligned splice. The entire operation requires but a few seconds.

Both rewinds are geared four-to-one to enable fast work and examination of frames in either direction from the splicer. Two glass-stoppered bottles—one for cement and one for water—are conveniently placed at the rear of the splicer, and a two-ounce can of Kodascope Film Cement is furnished.

United Artists Building New Sound Stage

United Artists are constructing a new sound stage at the Hollywood studios which is expected to be one of the largest in the business. The stage will be 225 feet long, 132 feet wide and 73 feet high, and will be large enough to accommodate outdoor sets. Even a huge pipe organ is to be included along with ten camera booths.

Amateur Movie Making

Continued from Page 27

can hardly be expected to use a definite script, but they can and should know fairly accurately just what is to be done and how to do it. While a written outline is invaluable, it is not always practical; but a clear mental picture of what is to be photographed is almost always possible, and the ability to visualize beforehand should be cultivated. It is an essential to successful cinematographic work of any kind. It expedites the actual shooting, and saves film in the really practical way. It makes the work easier, quicker, and more beneficial. And no really great cinematographer or director has ever been without this power of visualization; it is the prime foundation of success in screen art. Therefore, it is the one thing above all others that the amateur should seek, master, and cultivate if he would realize his aspirations toward true cinematographic artistry.

Italy

It is announced that the Cines Studios in Rome, which are the largest in Italy, will be turned into sound studios.

England

Supreme Film Ltd., announces through the British Press, the production of feature pictures by an entirely new sound film process, which is known as the "Aperiodic Non Microphonic" process. The films will be available for any sound film reproducing apparatus.

All In the Day's Work

Continued from Page 4

years ago had his camera in a plane to shoot closeups of Jack Mulhall and Dorothy Mackaill. The plane was too heavily loaded for flying. The outfi,t was warned, but they did want that scene. So the plane started down the runway. Suddenly it took off a few feet and then shot back for the ground. By a miracle the ship landed without mishap. But there was a terriffic jolt. And there was Arthur hanging on to his camera, hoping it would not be broken.

Yes, the stunt men and actors do some brave things in the air for the sake of thrilling the public. But they are highly paid and get much publicity out of it. But the unsung heroes, the cinematographers, are always "on the tail" of their ships—only you rarely hear about it.

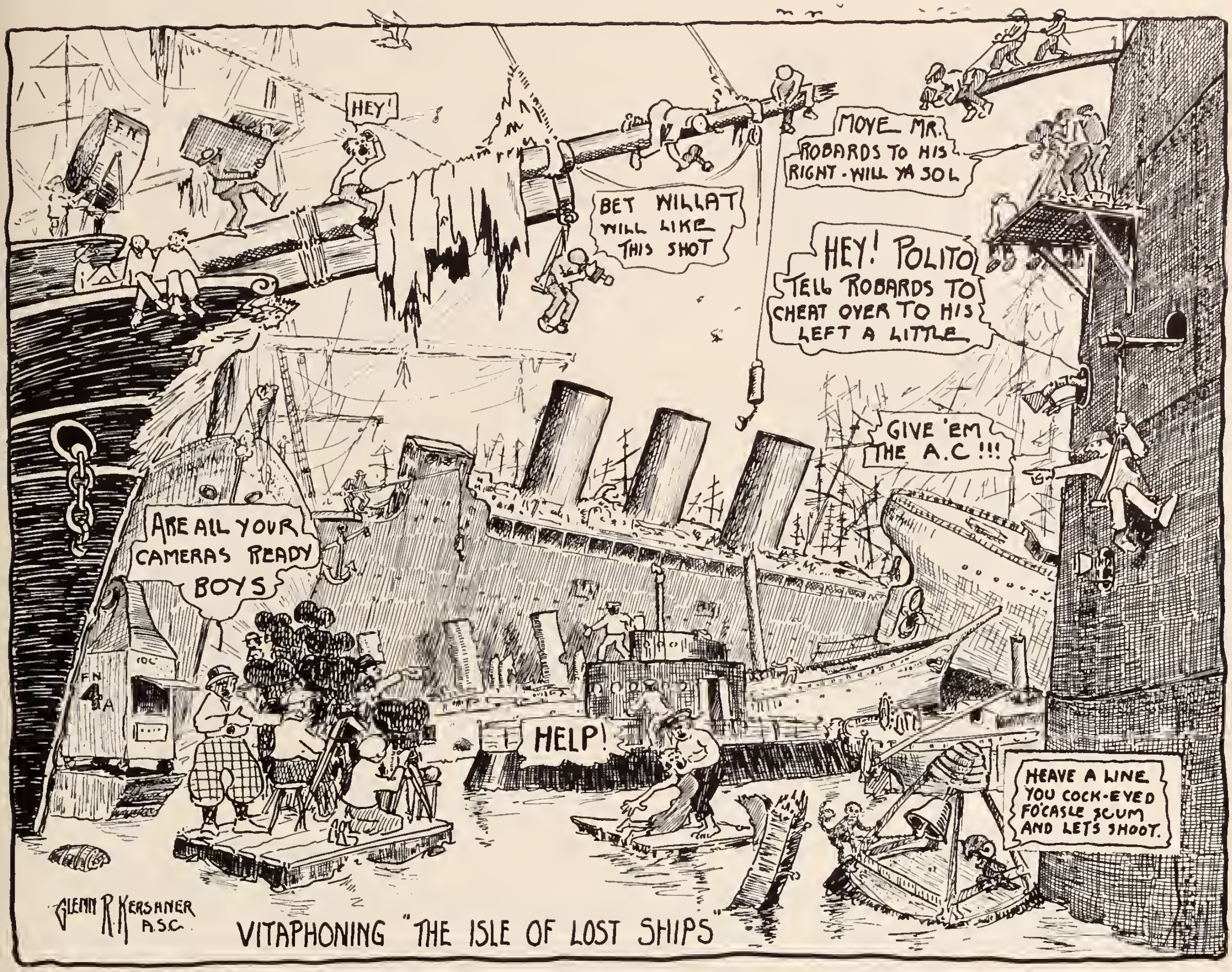
"Hell's Angels" to Open in October

Caddo Productions' great air picture, "Hell's Angels," is at last tentatively scheduled to open in New York in October. Present plans call for the premiere of this picture at the George M. Cohan theatre where it is planned to stage an extended run.

More than two years' work have been put in on this production which the youthful producer, Howard Hughes, hopes will be the greatest air picture ever made. Reputed cost is more than $3,000,000. Sound, dialogues and color effects have been incorporated in the picture.

Harry Perry, A. S. C., has had complete charge of the photography of this picture. Under his cinematographic direction scores of cameramen have worked for months, much of the time in the air, and Mr. Perry is highly enthusiastic over the air photography.

The Lyric Film Exchange, which operates the new Lyric Theater in Manila, announces that it will install a talking moving picture outfit in its theater sometime before July.



VITAPHONING "THE ISLE OF LOST SHIPS"

Fine Grain Developer

Continued from Page 18

about three minutes longer to produce the same degree of development than the other methods. All the data on rate of development recorded were obtained by the rack and tank method unless otherwise stated.

To interpret correctly the data represented by the time-gamma curves, it is necessary to know the gamma that is used in current practice and the limits in terms of gamma for flat and contrasty development. It was found necessary to determine the degree of development in current use in the commercial film laboratories. Sensitometrically exposed strips of film were sent to nine of the film laboratories in Hollywood, Calif., and developed under normal processing conditions. The gamma values varied from 0.44 to 0.70 with most of them falling in the range from 0.55 to 0.65. H. & D. strips were developed together with a large number of customers' negatives taken outdoors that were developed by judgment in the Eastman laboratory, and these gave an average gamma value of 0.80. This higher gamma value is necessary in the case of commercial negatives taken under average conditions in the eastern part of the United States because the brightness contrast of the objects photographed outdoors is not so great as that prevailing in Hollywood.

The maximum gamma that can be obtained depends upon the nature of the emulsion used, the developer, and the method of development. For Eastman motion picture panchromatic negative film (type 2) with the borax developer and the rack and tank method, the maximum gamma is 1.4. Since the average gamma of studio negatives is around 0.65, it is seen that ample contrast is obtainable with the borax developer.

In the study of the developer formulas it is necessary to consider the fog produced as well as the rate of development. The three curves at the bottom of Fig. 2 show the fog values for the borax developer for three different development temperatures.

(C) Watkins Factor

Some workers, who develop negatives by judgment, observe the negative during the early stages of development and determine the time of appearance of the first trace of image. The factor by which this time must be multiplied to give the desired time of development for a normal negative is called the Watkins factor. Tests have been made with various types of negatives in fresh and used fine-grain developers and the Watkins factor has been found to be 8.0 for a gamma of 0.7.

(D) Variation of Properties with Methods of Mixing

In some preliminary experiments, variations were found in the rate of development for different batches of the same developer. A test was made to determine the effect of varying the mixing temperature. One developer was compounded[10] with water at room temperature (65°F.) and another with water at 180°F. Both developers gave the same rate of development. From this it was concluded that the early variations were due to errors in compounding the developers. It is necessary to exercise great care in weighing out the correct quantity of borax because the borax developer is very sensitive to slight changes in alkalinity. In a very dry climate, borax should be stored in a closed vessel to prevent any loss of the water of crystallization.

(E) Function of the Constituents of the Borax Developer

(1) **Developing Agents.**—Elon is the principal reducing agent and is responsible for starting the develop-

ment of the negative. The hydroquinone helps to build up the heavy densities, but if used alone, it does not have sufficient reducing power to start the development. If development is started in an Elon developer, however, it can be completed with one containing only hydroquinone as the reducing agent.

(2) **Sodium Sulfite.**—This salt is an inorganic reducing agent and protects the developing agents from oxidation by the oxygen absorbed from the atmosphere. Its solubility in the developer formula is such that the concentration of sulfite can be increased from zero to more than 200 grams per liter. An increase in concentration above 100 grams per liter slightly decreases the rate of development partly because of its solvent action upon the silver halide in the emulsion. This solvent action is of the utmost importance from the standpoint of graininess and will be discussed later.

(3) **Borax.**—This chemical is used because it is a very mild alkali and gives a developer with very low alkalinity when used with a mixture of Elon, hydroquinone, and sodium sulfite.

(F) Effect of Varying the Concentration of the Developer Constituents

The rate of development, speed of emulsion, fog, graininess, etc., produced by the borax developer can be altered by changing the relative concentrations of the constituents used in the developer and by the addition of other chemicals such as potassium bromide, hypo, and sodium sulfate. Several experimental developers were compounded in an attempt to decrease the rate of development without decreasing the speed of the emulsion or increasing the fogging action. The tests were made with a small developing apparatus, but with the same technic as used in commercial work. H. & D. curves were made for the various development times and the gamma values determined as shown in Table II. The fog values and Eastman speed are given for a gamma value of 0.70. The

Table II

Effect of Variations in Composition on the Properties of the Borax Developer

Expt. No.	Constituents of Developer, Grams per Liter: Elon	Hydro-quinone	Sodium Sulfite	Borax	Potassium Bromide	Gamma: 6 Min.	9 Min.	12 Min.	15 Min.	18 Min.	21 Min.	Data at Gamma of 0.7: Relative Speed	Fog	pH
1	2	5	100	2		0.41	0.58	0.73	0.82	0.91	1.00	530	0.20	8.5
2	2	5	100	2	0.1	0.38	0.52	0.67	0.76	0.85	0.94	740	0.18	8.5
3	2	5	100	2	0.5	0.37	0.51	0.66	0.74	0.84	0.91	646	0.16	8.5
4	2	5	100	2	1.0	0.34	0.48	0.62	0.72	0.80	0.86	450	0.15	8.5
5	2	5	100	2	2.0	0.33	0.44	0.54	0.65	0.75	0.82	412	0.15	8.5
6	2	5	100	2	5.0		0.35	0.44	0.56	0.66	0.71	150	0.08	8.5
7	4	5	100			0.35	0.52	0.67	0.76	0.85	0.93	635	0.13	7.8
8	4	5	100	2		0.43	0.60	0.71	0.80	0.90	0.98	660	0.15	8.1
9	4		100			0.35	0.50	0.61	0.71	0.80	0.86	590	0.15	7.9
10	2	5	100	20		0.72	0.92	1.03	1.11	1.20		550	0.16	9.2
11	2	5	100	6		0.53	0.72	0.89	0.98	1.04		575	0.20	8.9
12	2	5	100			0.31	0.47	0.60	0.67	0.73		490	0.18	8.1
13	2		100			0.31	0.48	0.60	0.67	0.74	0.78	560	0.15	8.3
14	2		100	2		0.33	0.52	0.62	0.70	0.78	0.86	741	0.15	8.6
15	2	10	100	2		0.42	0.60	0.73	0.84	0.97	1.05	590	0.14	8.5
					Sodium Sulfite Anhydrous									
16	2	5	25	2	50	0.32	0.47	0.60	0.70	0.77	0.82	513	0.19	8.3
17	2	5	50	2	50	0.37	0.54	0.67	0.75	0.83	0.88	540	0.19	8.4
18	2	5	100	2	50	0.29	0.50	0.67	0.75	0.80	0.87	500	0.18	8.5
					Hypo									
19	2	5	25	2	1	0.32	0.41	0.55	0.64	0.74		390	0.14	8.4
20	6		100	6		0.55	0.71	0.85	0.93	0.98	1.06	660	0.15	8.3
21		10	100	20				0.28	0.37	0.53	0.67	360	0.16	9.2
					Potassium Bromide									
22	1	2.5	50	1		0.32	0.46	0.54	0.64	0.67	0.75	670	0.20	8.7
23	1	2.5	100	1		0.34	0.47	0.57	0.64	0.73	0.80	780	0.19	8.8
24	1	2.5	100	1	1	0.26	0.37	0.51	0.61	0.70	0.77	427	0.11	8.8
25	1	2.5	150	1		0.29	0.40	0.50	0.60	0.68	0.73	690	0.17	8.9
26	2	5	25	2		0.38	0.55	0.67	0.73	0.80		468	0.17	8.3
27	2	5	50	2		0.37	0.59	0.70	0.81	0.90	0.95	692	0.16	8.4
28	2	5	100	2		0.41	0.58	0.73	0.82	0.91	1.00	530	0.20	8.5
29	2	5	150	2		0.33	0.50	0.62	0.72	0.80	0.88	676	0.14	8.7
30	2	5	200	2		0.26	0.36	0.47	0.60	0.67	0.76	646	0.17	8.7

Recent Releases of A. S. C. Members

"Blockade"—R.K.O.—Robert Martin.

"Gentlemen of the Press"—Paramount—George Folsey.

"The Lone Wolf's Daughter"—Columbia—James Van Trees.

"The Tip-Off"—Universal—Chas. Stumar.

"She Goes to War"—U.A.—Tony Gaudio.

"Laughing at Death"—R.K.O.—Virgil Miller.

"On With the Show"—Warners—Tony Gaudio.

"From Headquarters"—Warners—Wm. A. Rees.

"The One Woman Idea"—Fox—L. W. O'Connell.

"The Studio Murder Mystery"—Paramount—Victor Milner.

New Projector Announced

LONDON—Development of a new projector, financed by a London syndicate, has just been announced here. The claim for the new projector is that it will eliminate shutter intervention and offer advantages in the projection of colored and talking pictures.

The inventor claims that with the use of a continuously moving film the projection of talkers is enhanced, claiming perfect synchronization between sight and sound results. The flicker disappears with the absence of the shutter and the film is projected at the same rate of speed as film is taken, he says, declaring breakage and damage of sound track or colored film will be reduced.

same roll of Eastman panchromatic negative film was used for all of the tests. The type of H. & D. curve obtained with this emulsion is shown in Fig. 1. The developers are arranged roughly in the order in which they were tested and in terms of the extra constituents which were added.

(1) Effect of Varying the Concentration of the Developing Agents.—It is possible to double the concentration of Elon and hydroquinone in the regular borax formula. This increase produces a solution which is so near the saturation point with respect to these chemicals that it is not of practical interest.

The Elon content alone can be doubled but this produces no appreciable increase in the rate of development because the effect of the Elon is offset by the decrease in alkalinity (Nos. 1 and 8, Table II). The effect that can be produced by an increase in the borax content will be discussed under "alkalinity."

Continued in the August Issue

Actors Now Argue with Selves via Movietone

HERE we see Alan Burmingham talking to himself in a scene from a Fox Movietone picture, "Masquerade." This is the first dual role made in Movietone. The remarkable feat of showing an actor playing two roles in a closeup shot and talking at the same time is what has been accomplished. Dual roles in the silent drama have long been customary, but to double expose the voice is a new wrinkle. Note the photograph of the man's voice on the sound track on the top of the film.

German Scientist Remarkable Figure at Age of Seventy

An article appeared in the May issue of the **American Cinematographer** under the above heading, in which some of the achievements of the German Scientist, Dr. Paul Rudolph, were mentioned.

Quite a voluminous correspondence has reached the desk of the Technical Editor in reference to it. Some letters referring to errors, which apparently had crept into it, could not be set aside and for the sake of correctness we gathered some definite information from a source, which we consider most authoritative and reliable: Dr. Hovestadt's book "Jena Glass and Its Scientific and Industrial Applications."

It is well known that the Science of modern optics was born through the remarkable work conducted by Professor Abbe and Dr. Schott at Jena. Professor Abbe evolved the system of complete pre-determination of all the data necessary for the construction of microscopic and all other optical systems, and his new theories and formulae of lens optics remain as a monument to his fecund genius. However, he soon found himself up against the lack of suitable raw material. Most of the optical glass obtainable at that time came from England, but only very few varieties existed and these were sold according to their specific weight.

In collaboration with Dr. Schott, Professor Abbe conceived the idea of varying the optical properties of glass by introducing new materials into the formulae. It is due to the perseverance and energy of Abbe and Schott that after many years of experimental work, optical glass was produced on a scientific basis and in many varieties. Such glass alone made possible the construction of optical systems according to the pre-determined computations of the new optical theories of Professor Abbe. The association of Professor Abbe and Dr. Schott proved extremely fruitful, and universal recognition of their work materialized for the first time, when the new microscopes built according to Abbe's formulae and with Schott Jena Glass, led to the epochal discovery of bacteria as the cause of many infectious diseases.

It was after this that Professor Abbe, the head and owner of the firm of Carl Zeiss, engaged Dr. Rudolph as his disciple and assistant. Dr. Rudolph worked under and in intimate contact with Professor Abbe, when he developed, on a plan suggested by Abbe, the famous Anastigmat lens. This remarkable objective, conceded to be the corner stone upon which modern photographic optics are founded, has justly brought undying fame to the two men who devoted much energy, vision and scientific knowledge to its development.

Dr. Rudolph in 1908 retired from his professional occupation in the Zeiss Works, due to various commercial reasons, but in 1917 the exigencies of the war laws for civil service brought him to resume his activities with the Carl Zeiss firm of Jena. It was in connection with this work that Dr. Rudolph developed the Plasmat objective and submitted it to Zeiss. Zeiss, after examining the new objective, saw no advantage in it, and they raised no objection to Dr. Rudolph's offering his new lens to a competitive firm.

The services rendered by Dr. Rudolph in the construction of modern photographic lenses are indisputable. It is also an historical fact that to Professor Abbe, the spiritual founder of modern optics, and to his inventive genius we owe the inauguration of the present era of photographic developments.

We are glad of having the opportunity to present to our readers what we believe to be the true facts relative to this extremely interesting period in the history of photography.

Royalty Shoots Its Own

Royalty is now joining the rapidly growing ranks of amateur movie makers, and report has it that cinematographic enthusiasm is running high in the palaces of England's royal family.

The Duke of York, second son of King George, is the first member of the family to become an amateur cinematographer. His latest home-made production features his 3-year-old daughter, Princess Elizabeth. The "World Premiere" was held at Craigwell house. Both the king and queen are said to have applauded the work of the young star as well as the technique of the duke-director.

Cinophot and Dremophot Exposure Meters for Amateurs

One of the constant cries from the amateur who is just beginning his picture making is to the effect that he does not know what exposure is correct under various conditions. The result is that he wastes many, many feet of film, and loses many excellent shots.

What are the correct exposures for sun and twilight, studios, interiors, mountain scenes, seascapes, titles and the like? That is the ever-present question in the amateur's mind.

This worry can readily be greatly removed if the amateur will avail himself of the opportunity to buy one of the Drem Products Corporation's devices for this purpose. The company manufactures the Dremophot and the Cinophot exposure meters. The Dremophot is specially adapted for Bell & Howell Filmo 70 and 75. The Cinophot is used on the Eastman Cine-Kodak, but may be used on the other movie cameras as well, such as DeVry, Victor, etc. An investment in one of these useful devices will save much waste footage and disappointment.

Japan

A Japanese Film consortium, "The Matsutake Film Company," decided to establish a branch in Berlin with a view to producing Japanese films in Germany. This is the first time a Japanese film concern has attempted to establish its business outside of its own Country.

Accomplishment

Continued from Page 11

"Yes," Sheila answered eagerly. "Tonight, if you like, but let's stay home. I don't feel like going out."

Another pause, then: "As you wish, Ma Cherie. Until tonight, Au Revoir."

Sheila hung up, heartened, encouraged. It would be good to see Sir Charon. Happily, she busied herself about the house. She even considered rearranging the rooms. If Del had—why should she think of Del whenever Sir Charon came to mind? Surely Del had walked away from her for the last time. And yet—the door bell rang.

She answered the summons. It was Del, with a big bundle of her father's personal things from the armory. A different Del. This one no longer had steel-blue eyes and granite-like face. His eyes were soft as baby's eyes. Tired eyes. She realized that whatever had made them hard was gone, gone forever, and, womanlike, she seized the advantage they offered by putting into her own the hardness which had once been his.

"You may put that bundle there on the divan," she said when he told her what he had brought. She could be hard now. Sir Charon had called her—he was coming tonight to comfort her. Yet, Sheila could not keep her gaze entirely away from the shining bronze medal hanging from the stalwart American's breast.

He began checking the contents of his bundle. A full-dress uniform. Several uniforms worn by the Queen's soldiers in the tropics. A saber. Several campaign medals, Sheila grabbed them.

"He was a better soldier than you'll ever be, Del Wilton," she said vindictively; at the same instant her gaze caught the D. S. C. on the broad chest before her and she bit her lip. Why should she want to hurt Del? Del was right. She had been a little snob, was behaving like one now.

"He was," Del corroborated evenly.

His very willingness to be agreeable spurred the evil impulse to wound him she had regretted before he spoke.

"If it had been the other way around, dad would have had the guilty man lined up in front of a firing squad long ago," she declared and dared to look at him. She expected anger, fury, anything but to see those hurt blue eyes remain hurt and baby-soft. She realized then the unfathomable depth of her love for him! She had always loved Delavan Wilton! It had been fun to tease him, that was all, and now that he was lost to her she knew she loved him! She hung her face to hide the tears.

"Perhaps you-all are right," Del said, in that exasperatingly cool and drawing voice. "I may be the dumbest bloke in the world, but if you can tell me how in the name o' God you can trace a murderer with these as the only clues, I'll wade through hell to do it!"

FROM a pocket he took two objects which Sheila stared at uncomprehendingly. One was a torn piece of grey tweed, apparently the fragment of a man's coat. The other was a crushed, withered remnant of a goldenrod chain.

"What—I don't understand," she said haltingly.

"These were clutched in your father's right hand when they found him in his plane," Del explained. "Apparently he tried to grapple with the bloke who shot him, but all he could do was grab the skunk's coat. His murderer got away leavin' only a piece of his lapel and this goldenrod chain as evidence. Hell, only luck will ever turn up the louse who shot your father."

Goldenrod chain? Luck? Sheila frowned. Why should those words stir some half forgotten memory? Why was there something vaguely familiar about that torn fragment of cloth? A goldenrod chain. Goldenrod. The first real goldenrod she had seen in years were those she and Sir Charon had picked that day—THE goldenrod chain! Her fingers at his lapel, her voice whispering: "Wear it, it will bring you luck." Luck? Sir Charon had on a grey tweed coat, and the pattern of that torn bit in Del's hand was the pattern of Sir Charon's—Then she remembered the cameraman.

"Oh," she gasped, her eyes wide with horror, "it can't be. It's not so!"

"What's not so?" demanded Del.

She looked up at him, her face a mask of horror.

"Oh, Del," she wailed. "I made that goldenrod chain and put it in that lapel not more than ten hours before dad was killed!"

"What!" Del snapped—then a shadow of pity crossed his face—"aw you poor kid, you-all have had a tough time—honey, you're all tired out . . . " He stepped close to her and embraced her tenderly.

"No—no, Del," she sobbed, "that day with Sir Charon—the day—we took some pictures . . . ."

"Wait, de-ar, who the hell is Sir Charon?" he interrupted her. Then he remembered. Sir Charon Haydon-Winnington, diplomatic corps, highborn—

"Listen!" he commanded. "What does this bloke look like? Here, wait a second." He brought a handful of papers from an inner pocket, selected one, spread it on the table before her. "Is this the bloke?" he demanded.

Sheila looked and a cry escaped her. The picture swam before her eyes. She saw the paper was printed in French. She felt herself slipping. "Yes," she said faintly, "that is Sir Charon."

In a daze she heard Del slowly read: "A master spy. German. Escaped from La Roquette prison. Wanted for espionage and wholesale murder. Correct name: Baron Elrich Von Sternburg," and so on Del read monotonously until he ended with the signature of the French Prefect of Secret Service.

It was a record that the devil himself might be proud of. Somehow, the revelations stirred a world of energy in Sheila Standish.

In five minutes Del learned every fact Sheila had concerning Sir Charon, from their meeting at a diplomatic ball, to his telephone call early that afternoon. And while talking, her hands rummaged through a cabinet drawer until she found a small roll of celluloid film.

"Look!" she exclaimed. "Here's the picture we took that day. The cameraman brought it over the day after dad's funeral," she gulped—"I had completely forgotten it; never even looked at it."

"Let me see it, honey," Del said, and took it from her hand.

Holding it toward the light, he slowly unwound the film and exposed to their eyes the entire scene which the cameraman had shot that day in the goldenrod field. Del stopped when he came to the scene where Sir Charon put his arms around Sheila. "It's the bird the French want, I reckon," he snapped, "but let's put it on your projector to make su-re."

Quickly, they put the film into the machine and turned on the motor. Del snapped off the lights, plunging the room in darkness. Again the picture was revealed before their eyes. It was now life-life—to Del revoltingly life-like.

"Well, he's the bloke, the . . ." he choked back bitter curses—"I reckon he was playin' you-all because you were Colonel Standish's daughter, an', oh well, I had no way of knowin'. I didn't get this circular until today, an' o' course no commoner ever suspects a highborn. . ."

"Oh, Del, please don't say that again."

"All right, honey. Now! I'll tell you what we'll do." he said authoritatively. "When he comes, bring him into this sittin' room, then. . ."

"Oh, Del, oh, no, I can't!" Sheila sobbed. "I can't ever face him again."

"You must, honey," he said. "It's the only su-re way o' nailin' him! It's up to you-all to tag your dad's murder on him an' I'll be in the dinin' room as witness. When he sees these pictures he'll give himself away su-re. Then I'll nail him! You-all must do it, honey!"

He held her away from him so he could keep his eyes on hers.

"I love you-all, Sheila, de-ar," he continued, his voice again low and drawling, musical. "I love you-all mor'n life, just like your dad loved you. Shore you'll go through with it fo' two men who loved you-all that much?"

She gave a throaty cry that was joy, relief, and a dead hope revived, as she clasped the big hulk of him to her, kissed his eyes, his forehead; wet his cheeks with a shower of hot tears. Del loved her more than life itself! What was there to fear now? How could Colonel Wyndam Standish's daughter, loved by Del Wilton, fear anything?

"Yes, dear, yes—what do you want me to do?" she asked, and Del stifled a sigh of relief at the calmness of her voice.

"First, I want your promise to marry me—tomorrow! —an' let me protect you-all forev-er."

"I promise, Del, and—oh, I love you so much!" Again she fell into his arms.

"Honey—honey," he stammered, "an' you-all will go back to America with me? This war will be o-ver, an' then. . ."

"Yes, dear," she gasped for joy.

"Good! Now listen, this is what we'll do."

Twice he repeated the details slowly, carefully. "Got it now?" he asked, and the voice was that of a fighting man, not a sweetheart.

"Yes, dear," she said gravely.

"An' remember," he emphasized, "if he does grab you, don't struggle! For the love of God, Sheila, don't fight! Because I might kill you!"

"All right, Del," she assured him and he knew she would not fail.

FOR ten minutes Del sat in the dining room and talked with Sheila in whispers. His eyes continuously strayed through the window to the street. As darkness was falling he saw the blue roadster draw up to the curb. Grimly he watched a dapper civilian step jauntily to the sidewalk and approach the house.

"He's he-re, Sheila," Del whispered hoarsely. "Steady, now. Remember what I told you!"

The stage was set for their live's greatest drama.

A bell rang. Sheila, pale, but to all outward appearances calm, went to the outer door. Del crouched behind a portiere that shielded him from view of anyone in the living room, but from where he could command it. As the sound of voices drifted to him, he carefully cocked his automatic pistol. He stiffened as the living room door opened and closed.

"Do you mind sitting here a minute?" It was Sheila's voice. "I was just having a bit of tea," she nodded toward the cup and teapot. "Will you have a cup, Sir Charon?"

As she spoke she indicated a chair that would place Sir Charon with his face toward the darkened dining room.

"Ah, yes, Ma Cherie," Sir Charon accepted, seating himself. Del Wilton studied his face and elation quickened the American's pulse.

They talked commonplaces while Sheila prepared the tea. She set a cup before him and as he raised it to his lips, she plucked the torn piece of tweed and the remnant of goldenrod chain from her bodice and tossed them on the table before him.

"Where did you lose those, Sir Charon?" she asked, stepping back a pace.

EVEN Sheila was thrilled by the spy's nerve. Nothing very perceptible happened. Slowly, deliberately, he replaced the cup in the saucer. Just as slowly, steadily, his right hand went under his left arm and came out holding a shiny automatic. He didn't point it at her, just held it alert.

"Ah, my sweet, is this a doublecross?" he asked softly. For a fleeting instant wondrous eyes swept the room, then he smiled.

Sheila smiled, too. Del told her this would be the time to smile.

"No," she said, "if I'd wanted to doublecross you, I could have done it long ago. I knew the Intelligence Department was after you. But I liked you, and,"—was it a sob or a laugh that caught in her throat?—"I didn't get along so well with dad. He tried to make me play spy, too."

She paused, poured herself some tea, and indicated the cup before Sir Charon with a gesture. "There's no poison in it," she said calmly, "go ahead and drink."

He put his gun back in its holster, lifted the cup in a semi-salute, and without taking his eyes from her, he drank.

"Sir Charon, do you remember the cameraman that day, and the pictures he took of us?"

"Yes, Ma Cherie, why do you ask?"

"I have them. Would you like to see them on the screen?"

"That would be jolly, rippin', eh?"

"Turn your chair around facing the other way, and don't be afraid when the lights go out!"

He turned his chair, perfectly at ease, and she switched off the lights and switched on the projector. In a moment a beautiful scene flashed on the screen before them. They saw themselves sitting in Sir Charon's blue roadster; saw the goldenrod field, her arms full of flowers; he trying to kiss her; then she said, and her voice labored with emotion:

"I was ready to go with you that day, but you didn't seem to care enough. A girl likes to be rushed, Sir Charon."

"Ah, my sweet," he replied, "you are so won-der-ful, I did not know, you"—the picture came to the scene where she put the goldenrod chain in his lapel—"were this Colonel Standish's daughter, until I read about it in the bulletins the next day."

The film drew near the end and, "however," he continued, "I am sorry I had to do it. Will you. . ."

"Oh-h-h-h!" Sheila groaned in the darkness, and in that one grief-stricken exclamation, Baron von Sternburg knew he had been doublecrossed! That same instant the lights went on. The German quickly drew his ugly automatic with his right hand and swept it in the arc of a circle to bring it to bear on Sheila, but a bullet from Del's gun smashed his hand. Sheila, not knowing which had fired, fainted.

Von Sternburg snarled out an oath in bitter Teutonic and sprang back toward the wall, facing Del, still with his finger on the electric switch. His eyes fell on his pistol laying on the floor near the able.

For only a second he stood there, but in that tense period, which seemed a year, Delavan Wilton thought of many things. He thought of all that frequently occurs to keep these international spies from facing the firing squad. He thought of this one's inhuman escapades. He thought of Colonel Standish shot dead from behind, and hunched over at the controls of his airplane and clutching a torn coat lapel and a goldenrod chain.

Then he raised his automatic, squeezed the trigger, and—Baron Elrich von Sternburg, alias Sir Charon Haydon-Winnington—highborn—was no more.

Another story by Mr. Griffith will appear in an early issue of the American Cinematographer. Place your order with your newsdealer early each month so you won't miss it.

Precious Films May Be Saved

"What can I do to keep my films from cracking and becoming destroyed and useless?"

Again and again do we hear that question from the amateur who has, perhaps, a roll of film showing his little baby who has passed on. Perhaps it may be a reel of scenes shot at a scene that is almost sacred to him. To lose these films would be tragedy. But daily someone is losing a priceless treasure because the image has worn off, the film has cracked—has become worthless.

The composition of 16 mm. film is as follows: The acetate cellulose films contain acetate cellulose about 70 per cent, and about 30 per cent of plasticizers or ingredients for softening the film. These are such as castor oil, camphor, phenol phosphates and various pthalates.

The slow-burning or safety film contains, in general, two parts of nitro-cellulose, one part camphor, two to five per cent oil and traces of amyl acetate. Slow burning substances with a high flame point are added.

The emulsion on both kinds of film is composed of gelatine and sensitized substances like silver salts. The consistency of the base changes slowly through evaporation of the chemical binders. The film gets brittle and less pliable and in a few years will contract somewhat. The emulsion dries with time and may peel. Excessive moisture causes the emulsion to become sticky, causing friction on the tension springs in the projector, and producing streaks or "rain" on the surface of the emulsion. In time the film becomes worthless as the gelatine is destroyed and the image is worn off.

However, Albert Teitel of 105 West 40th Street, New York, has a process on the market which many noted authorities, such as Carl Louis Gregory, recommended as a "new life" process for films.

This process consists of the following: The film is saturated in an organic compound with a high flame point. Plasticizers are relaced and the film is then immersed in a composition of non-evaporating and slow-evaporating solution. Then the film is passed through a specially designed machine which removes all superfluous solutions, and is then finished with a soft silk buffer. This process, it is claimed, will keep the film pliable for years. After so processing the film is lubricated and all foreign substances are removed and the image is given greater clarity.

The advantages claimed from this Teitel "New Life" method are: the life of the film is prolonged; film is cleansed and given better transparency. It runs more smoothly and sprocket tears are said to be eliminated, also buckling and gumming. And the frequent pad moistening in a humidor is eliminated.

Mr. Gregory, Fellow of the Royal Photographic Society of Great Britain, recommends this method heartily. Those who are having difficulty may write to Mr. Teitel or get information from retail dealers in film supplies.

On Tinted Film

Continued from Page 20

tinted film base having a density of 0.3 will necessitate advancing the volume control by either 2 or 3 steps. This represents a relatively small percentage of the total amplification and there seems to be little doubt that the required increase in amplification can be obtained satisfactorily.

The permissible change in volume occurring in passing from one tint to another is, in the last analysis, dependent upon the sensitivity of the ear to changes in volume. Under ideal conditions of observation, the change in loudness corresponding to a volume change produced by one decibel variation in amplification is just perceptible. It should be remembered that this change is perceptible only under ideal conditions. The situation is similar to that which exists relative to photometric sensitivity, that is, the sensitivity of the eye to differences in brightness. For instance, in a photometric field where the two halves are immediately juxtaposed in such a manner that when the two parts of a field are identical in brightness the division line is invisible, a difference in brightness of two per cent (actually 1.7 per cent) is just perceptible provided that the field subtends a visual angle of 3°, that the brightness level is optimal, and that all disturbing factors are removed. Such ideal conditions seldom exist in practical work, however, and it is customary to regard a brightness difference of five per cent as the least difference which is of importance. Similarly, in case of oral sensitivity, when the comparison is made between pure tones of the same frequency immediately juxtaposed in time and of a loudness to which the ear is most sensitive, one decibel is just perceptible. In practice, however, it is probable that 2, or even 3 decibels constitutes a more rational specification of the amplification change which will produce a just noticeable difference in volume.

Table I

Visual Characteristics

No.	Color Name	Hue λ	Hue No.	T %	Description
0	Clear base	--	--	100	Hueless, clear
1	Rose Doree	[illegible]	1.0	57	Deep warm pink
2	Peachblow	619	4.0	61	Flesh pink
3	Afterglow	603	7.5	66	Orange
4	Firelight	590	12.0	[illegible]	Yellow-orange
5	Candleflame	585	17.5	75	Orange-yellow
6	Sunshine	579	23.0	83	Yellow
7	Verdante	520	36.0	57	Green
8	Aquagreen	505	40.0	40	Blue-green
9	Turquoise	490	43.0	46	Blue
10	Azure	484	47.0	28	Sky-blue
11	Nocturne	476	51.0	28	Violet-blue
12	Purplehaze	455	56.5	38	Blue-violet
13	Fleur de lis	-575	60.0	25	Blue-purple
14	Amaranth	-557	64.0	31	Red-purple
15	Caprice	-537	67.5	63	Cool pink
16	Inferno	-508	71.5	36	Red-magenta
17	Argent			71	Hueless

Visual characteristics of the series of tints.

On assuming, therefore, that a section of uncolored base is followed by a colored base having a photo-electric density of 0.3, the change in volume of six decibels will represent two, or perhaps three, just noticeable differences. Although this variation in most cases may not be unduly objectionable, it is felt that it is somewhat too great to meet the most rigid requirements. It is therefore proposed to establish also a lower density limit of 0.10 and to adjust the selective absorption of all the members of the series so that none shall have a density less than this value. Furthermore, it is proposed that when a hueless screen is desired a positive film tinted with a neutral (non-selective) dye be used. The photo-electric and, incidentally, the visual density of this is adjusted to a value of 0.10 corresponding to 2.0 decibels. If this material is used in conjunction with one having a density of 0.3 the volume change occurring at the transition from one to the other will be that corresponding to a change in amplification of 4.0 decibels. This total change is a

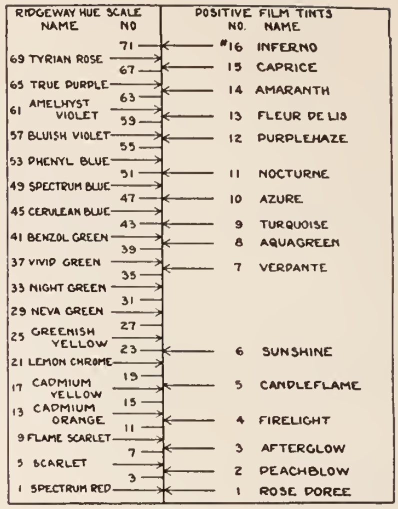


Fig. 4. Position of the tints on the Ridgeway Hue Scale.

little greater than the volume change which under practical conditions is just noticeable, and is certainly less than two such steps. It is felt that volume changes of this magnitude are entirely negligible in practical work especially since a change from one tint to another usually occurs with a scene change at which point a slight volume change may logically be expected.

It is of interest to apply this reasoning also to the case of maximum permissible density discussed in the previous paragraph. It will be recalled that a value of 0.3 for photo-electric density was fixed as being a reasonable upper limit. The amplification change required to give the same volume with such a film, as compared with clear base positive, is 6 decibels, which corresponds to two or perhaps three just noticeable volume differences. It is evident that this represents a relatively small increase in amplification and that no serious difficulty should be encountered in raising amplification sufficiently to compensate for the use of a colored base having a photo-electric density of 0.3.

The conditions which have been established, relative to permissible photo-electric density of tinted base for use in making sound positives, may be summarized as follows:

Maximum photo-electric density 0.3, amplification increment six decibels.

Minimum photo-electric density 0.10, amplification increment two decibels.

Table II

No.	Film Tint Name	Potassium D	Potassium T.U.	Caesium D	Caesium T.U.
0	Clear base	0.0	0.0	0.0	0.0
1	Rose Dorée	0.19	3.8	0.15	3.0
2	Peachblow	0.17	3.4	0.11	2.2
3	Afterglow	0.27	5.4	0.15	3.0
4	Firelight	0.27	5.4	0.11	2.2
5	Candleflame	0.24	4.8	0.09	1.8
6	Sunshine	0.27	5.4	0.06	1.2
7	Verdante	0.28	5.6	0.18	3.6
8	Aquagreen	0.26	5.2	0.27	5.4
9	Turquoise	0.10	2.0	0.24	4.8
10	Azure	0.09	1.8	0.27	5.4
11	Nocturne	0.09	1.8	0.28	5.6
12	Purplehaze	0.10	2.0	0.22	4.4
13	Fleur de lis	0.14	2.8	0.30	6.0
14	Amaranth	0.11	2.2	0.24	4.8
15	Caprice	0.09	1.8	0.14	2.8
16	Inferno	0.18	3.6	0.22	4.4
17	Argent	0.09	1.8	0.10	2.0
	Mean	0.176	3.5	0.184	3.7
	Maximum	0.28	5.6	0.30	6.0
	Minimum	0.09	1.8	0.06	1.2
	Maximum Δ	0.19	3.8	0.24	4.8

Photo-electric density characteristics of the series of tints.

Maximum variation in density 0.20, maximum volume variation four decibels.

It should be understood that the values of density specified above are relative to clear film base taken as equivalent to a transmission of 100 per cent, density 0. It seemed desirable to express all results in this manner since the factors of interest are those relating to the changes of photo-electric transmission, volume, etc., as compared to the conditions existing when the sound record is carried onto a clear film base.

On Table I are given data relative to the visual characteristics of these tinted materials. Considerable thought has been given to the names by which these tints are to be designated. It seems desirable, from a consideration of the probable associational and emotional value of color when applied to the motion picture screen, to designate these tints by names suggestive of their potential psychological effects and appropriate uses. This particular phase of the subject will be discussed in greater detail in a later section of the paper.

In the column designated as "y" under the title "Hue" are given the values of the dominant hue expressed in wave-length. These determinations refer specifically to the color of a white screen when illuminated by light from an arc of the reflector type with the tinted base placed between the light source and the screen. It therefore is a specific designation of the screen color

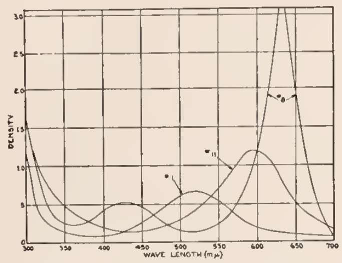


Fig. 5. Spectrophotometric curves for three tints.

obtained when these materials are used with a light source of this character. It is realized that in practice a certain variation in these hue values will result from the use of light sources differing from the one with which these hue measurements were made. For instance, when using a high intensity arc, either of the condenser or of the reflector type, the color of the emitted light is probably slightly bluer than emitted by a reflector arc using ordinary hard-cored carbons. Under these conditions the hue values will be shifted slightly. The difference, however, is so little as to be considered negligible from the practical standpoint. If these materials are used in a projector employing a high efficiency tungsten lamp there will probably be a rather great departure from the hue values indicated in Table I. This light is much yellower than that emitted by the arc and hence the use of a screen illuminated by a tungsten lamp in conjunction with these tinted bases will give appreciably different hues from those indicated in Table I.

In the column designated as "No." under "Hue" are the Ridgeway hue numbers. The system of color nomen-

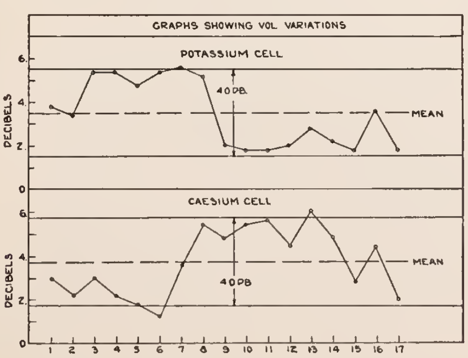


Fig. 6. Volume variation resulting from the use of the series of seventeen tints.

clature developed by Ridgeway[1] is one of the best available. The entire hue gamut, including the spectral hues and the non-spectral purples, is divided into seventy-two hue steps. These hue steps are equally placed on the sensation scale. In setting up a scale of hue it is not satisfactory to adopt intervals which are identical in wave-length difference because the sensitivity of the eye to hue differences varies enormously throughout the spectrum. In order to establish a normal hue scale in which the steps are equal in terms of sensation, it is necessary, therefore, to use wave-length intervals differing widely in magnitude.

It will be noted that, with the exception of a region in the orange, yellow, and yellow-green, the hues of these tinted materials are fairly evenly spaced on the normal hue scale. It seems highly desirable to adopt such spacing since it makes available the entire gamut of hue and a change from one tint to another produces a hue displacement of known and fairly equivalent subjective magnitude. The positions of the dominent hues of these colors are shown graphically on the chart in Fig. 4. At the left are given the Ridgeway hue numbers and the names applied by Ridgeway to these hues when occurring in colors of high saturation. At the right are the Ridgeway hue numbers for the tinted positive films and the names applied to these. It should be remembered that these colors are in general of relatively low saturation. At the right are the Ridgeway hue numbers for the tinted positive films and the names applied to these. It should be remembered that these colors are in general of relatively low saturation and it is considered that these more delicate tints are of greater utility for use in applying color to the motion picture screen than those of higher saturation. It is a rather peculiar coincidence that the colors corresponding to the hue numbers 25 and 35 which are absent from this positive film series are those which, according to all of the available psychological data (see Luckiesh, loc. cit.), are the colors classified as least agreeable or least preferred. These color preference data are derived from a large group of observers and hence are very significant. It has been impossible thus far to obtain these hues with sufficiently low photo-electric density. Possibly further search may reveal dyes which will permit the manufacture of these hues if such seems to be necessary or desirable.

In the column designated as "T" are given values of total transmission for these colored materials as measured visually using the reflector arc as a light source. These values are therefore a direct measure of the screen brightness obtained when using these tinted materials as compared with the screen brightness existing when using clear base positive. It will be noted that the visual transmissions of the red, orange, yellow, and yellow-green colors are relatively high; while those of the green, blue, violet series are relatively low. This condition exists since it is desired to obtain fairly definite color saturation effects. It follows as a natural consequence of the visual sensitivity and transmission characteristics of dyes that the colors in the former group have relatively high visual transmissions for a specified color saturation, while the transmission values in the second the color characteristics.

group are in general low when a cerresponding color saturation is obtained.

In the last column are given short verbal descriptions of To show spectrophotometric curves for all of the seventeen members of this series seems unnecessary but it may be of interest to consider two or three typical cases. In Fig. 5 are given such curves for tint No. 1 (Rose Doree), a warm deep pink; tint No. 8 (Aquagreen), a clear blue-green; and tint No. 11 (Nocturne), a deep violet-blue. Inspection of these curves shows that each of these colors has a decided density minimum throughout all or some part of that wave-length region in which the photo-electric response is maximum. The minimum density does not fall at the same wave-length in each case but shifts with the demands of the selective absorption necessary for obtaining the desired visual hue.

In Table II are given data relating to the photo-electric density characteristics of these materials for potassium and caesium cells of the types in extensive use in commercial installations. Density values are designed as "D," while in the columns designated as "TU" are given the equivalent values in decibels, these representing the amplification increment required to compensate for the volume depression occasioned by the use of these materials.

It will be noted that the specifications relative to maximum density and maximum density difference previously set forth as desirable have been made in actual materials with a fair degree of precision. In case of the potassium cell the maximum density is 0.28 (No. 7—Verdante), slightly less than the value of 0.30 considered allowable; while the density difference between the upper and lower limits is 0.19 (equivalent to 3.8 decibels), also slightly less than that considered tolerable. With the caesium cell the maximum density is exactly 0.30 (No. 13—Fleur de lis); while the maximum difference is 0.24 not appreciably greater than the specified 0.20.

The volume variation through the entire series of seventeen tints is shown in Fig. 6. The ordinates indicate the increase in amplification expressed in decibels required in each case to give the same volume output, with the tint, as indicated by the numbers at the bottom of the figure as compared with a sound record of identical characteristics on the regular clear positive film. The heavy horizontal lines are drawn at plus and minus 2 decibels from the mean of the entire group. These lines therefore define the allowable volume change as previously specified. In case of the potassium cell all of the tints fall between these limits; with the caesium cell two of the tints fall slightly outside these limits.

Prints have been made on all of these colored bases and sound reproduction with each cell is considered satisfactory, both with respect to the increase in amplification required and the maximum volume variation.

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Foreign News

Germany

"Ufaton" will be the designation for the future Ufa sound productions. The system is based on Ufa's and Siemens and Halske's photographic, acoustic and electrotechnical experiences. Every Ufa sound film will be made with a silent version.

A sound film studio is being built near Munich by a private Company. It will be leased to producers desirous of making talking pictures.

The plan of joining the sound film theaters into an international organization is taking shape. A German section has been formed.

Considering the lack of films, which is being felt now in Germany, the Association of German Exhibitors, has requested the Export Commission that distributors be authorized immediately to start filming imports under the new contingent, which was to become effective as of August 1, 1929.

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FOR SALE—One 5x7 Press Graflex Camera, with 8½-inch F 4.5. Zeiss Tessar lens; one 5x7 cut film magazine; one roll holder; one focusing back; and sole leather carrying case. Price, $95.00. All in new condition. Fred A. Parrish, 2526 West Colorado Ave., Colorado Springs, Colo.

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FOR SALE—Two slightly used Mitchell Matt boxes at $40.00 per set. Call Chas. Glouner at Universal Studios. HEmpstead 3131.

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The Kavirondo tribe of East Africa believe in having many Head Men. Here are a few of them ready for something or other. Photo by Clyde DeVinna, A. S. C.

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Vol. X

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No. 5

FOREIGN REPRESENTATIVES

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"The Call of the Wild"

HAVE you gazed on naked grandeur where there's nothing else to gaze on,
Set pieces and drop-curtain scenes galore,
Big mountains heaved to heaven which the blinding sunsets blazon,
Black canyons where the rapids rip and roar?
Have you swept the visioned valley with the green stream sneaking through it,
Searched the Vastness for a something you have lost?
Have you strung your soul to silence? Then for God's sake go and do it;
Hear the challenge, learn the lesson, pay the cost.

—Robert W. Service.

Upper Virginia Lake, High Sierras. Photo by Harry Perry, A. S. C.

Albert Summers Howell Elected to Honorary Membership in A.S.C.

Former Michigan Farmer Boy, Now Outstanding Figure in Mechanical and Motion Picture World, Third Man to Be Thus Honored. Other Two Are Thomas A. Edison and George Eastman.

AT THE last general open meeting of the AMERICAN SOCIETY OF CINEMATOGRAPHERS, Mr. A. S. Howell was unanimously elected to Life Honorary Membership in that Society.

This token of affection and gratitude was tendered by the Society in recognition of Mr. Howell's outstanding accomplishments in behalf of the Motion Picture Industry in general and of the CINEMATOGRAPHERS in particular.

Mr. Howell's life history is truly inspiring. From a farm in the lumber region of Northern Michigan to a position of worldwide recognition is, in brief, the story of Mr. Albert Summers Howell, Chief Engineer of the Bell & Howell Company of Chicago.

Those familiar with the educational facilities offered by lumber towns in Northern Michigan in the 80s and 90s will appreciate the fact that this farm boy, born in 1880, was forced to gain his early training under difficulties. But perhaps the very hardships he met contributed early to moulding the character, which now serves him so well in the continual development of equipment vital to the progress of the Motion Picture Industry.

In 1890 the Howell family moved to Indiana, where the 10-year-old boy worked intermittently in lumber camps and on his father's farm, attending the small town school whenever he could be spared, and keeping up his studying as best he could evenings at home during the season when his help was needed on the farm. He took special delight in keeping the farm machinery in repair and in all things mechanical about the farm and the lumber camp. But sawing, splitting and piling cord wood, plodding behind the ox-drawn plow, and planting and cultivating corn, did not offer the outlet he wanted for his rapidly developing mechanical inclinations, so the news that the family was to move to Chicago was welcome indeed.

1895 found the Howells established in their new quarters in Chicago, and young Albert working as an apprentice mechanic with the Miehle Printing Press Company. His salary was small, but he was working with machinery, there was much to be learned, and he enjoyed the work. From his earnings as much as possible was saved and when the savings permitted it he again took up his studies, enrolling in night school courses, first in High School, and finally in Armour Institute of Technology. To gain a college education under such conditions called for unusual perserverance and tenacity of purpose.

Albert Summers Howell

Finally his apprenticeship came to an end and he was a full-fledged mechanic. In the next few years he became connected with various small enterprises engaged in the building of such products as carsealing machines, berry box machines, and special machinery for making animal traps. Finally he entered the employ of a machine shop where a large part of the work was the building and repairing of motion picture projectors.

At that time the motion picture industry was in its infancy. Mr. Howell was fascinated with the mechanical operation of the equipment with which he was working. His close study of the projector enabled him to make many suggestions towards their improvement, which were gladly accepted by the manufacturers and users. Outstanding among these improvements upon the early projectors was the rotary framer, which is now used almost on all theatre projection machines.

His keenness in advancing projector design attracted the attention and interest of Don J. Bell, who, having no factory, was "farming out" the building of cine equipment to various machine shops, one of which was that in which Mr. Howell was working. Mr. Bell, appreciating the intensive and thorough understanding, as well as the active inventive ability which characterized Mr. Howell's suggestions, offered him a position, which later, in 1906, led to the incorporation of the Bell & Howell Company. A small shop was rented and manufacturing activities began late in 1906 and early in 1907. Mr. Howell was now in his element, in business for himself and working with the machinery that so fascinated him.

Soon it was evident to Mr. Howell that no matter how accurately a projector was designed and manufacured, it was practically impossible to obtain projection free from flicker and unsteadiness, unless all the machinery used in the Motion Picture Industry was designed and constructed with utmost precision. Perforators, cameras, and printeds were to be so constructed that the tiny image photographically impressed upon the film could be enlarged manifold upon the screen without the spectator being aware of such enlargement. To obtain this effect, which was to have such a tremendous influence on the success of motion pictures, Mr. Howell attacked the problems inherent to it with the thoroughness and the patience of a man of science, coupled with the enthusiasm of a pioneer.

His earlier work upon motion picture equipment had made evident to him the need for standardization in film processes. At that time there was an absolute lack of uniformity in perforation, which made distribution of a finished picture difficult and severely limited.

The work conducted by Mr. Howell in the field of standardization not only demanded a broad vision and great confidence in the future of the then nascent industry, but also a courage of convictions, which was most admirable, especially considering the opposition which usually characterizes any revolutionary enterprise.

The Bell & Howell Company, fully confident in Mr. Howell's righteousness and honesty of purpose, stood behind him with all its then small might, and although repeatedly asked to manufacture equipment for handling films not corresponding to the standards inaugurated by Mr. Howell, it maintained very energetically its attitude.

In his decision on standardization Mr. Howell was always guided by considerations of purely technical and scientific nature, and this, coupled with the perfection of design and manufacture of the machinery that he invented, brought about as a natural consequence, a full recognition of these standards, which have been adopted throughout the world.

All the professional film manufactured in America and in many foreign countries is perforated following the Bell & Howell Standards, which permits unlimited exchange of the releases.

In 1907, 1908, and 1909 the new company designed and built film perforating machines, film printing machines and motion picture cameras, all in accordance with their Standards.

The building of the Bell & Howell first cinematographer camera occupied much of Mr. Howell's time during the years 1907 and 1908.

This camera marked a turning point in the whole motion picture industry through its unusual refinements of design and construction, which eliminated all frictions and "static" troubles which were so evident at that time and which were the cause of severe losses to the whole industry.

Not only the camera was designed so as to be immediately considered as the best camera that could be had, mechanically speaking, but also it proved the care with which Mr. Howell took into consideration the exigencies that motion picture work imposed upon the men called upon to operate these instruments. A turret permitting the operator to have at his almost instant disposal four lenses of different optical properties, was one of the most visible, if not the most important, innovations incorporated in this camera. For the first time in the history of motion picture "fading," "fade-out," and "lap dissolves" were made possible by automatically changing the angular aperture of the shutter. The subtle design and the perfect manufacture of the main cams of the feed and take-up sprockets, and, above all, of the shuttle mechanism, amply justified the tremendous popularity which was enjoyed by this camera from its very inception.

For the first time in the history of cinematography, Mr. Howell conceived the use of pilots in both the perforator and the camera, which assured an undreamed of accuracy of registration, which contributed to a great extent to the popular success of motion pictures. This remarkable development, which assumed the proportions of an invention, has benefitted the general public insofar as it has made possible utmost steadiness in the projection of pictures, eliminating all fatigue of the eye, and it has also benefited the cinematographer and the laboratory motion picture workers insofar as it relieved them of many of the mechanical cares and worries with which they were besieged prior to Mr. Howell's inventions, and permitted them to devote most of their efforts to the artistic and technical achievements which characterize the motion picture productions of today.

As important as the designing of the Bell & Howell camera is Mr. Howell's conception of the film printing machine. At the time the Bell & Howell Company was organized, films were printed by the slow process of handling each individual scene separately and light changes compensating for varying densities of the negatives were made by hand. Mr. Howell's continuous film printer made possible not only a greater accuracy of the registration, but also a great reduction in laboratory work as it automatically adjusted itself for varying exposures. Since every laboratory was naturally interested in reducing its overhead expenses and increasing its production. Mr. Howel's printer rapidly achieved the recognition and distribution of his other products. Today most of the professional film is printed with this machine and perhaps most of it is thrown upon the screen by projectors which include Mr. Howell's contributions in their design.

The most outstanding feature of Mr. Howell's printer consisted in the elimination of creepage or slippage of the film.

A strip of negative film shrinks after exposure and processing and becomes, therefore, shorter than the positive film. When two strips of films are carried through the printer together it is impossible to make them register perfectly before the printing aperture unless some provision is made to offset the difference in length. Mr. Howell conceived the equalization of these differences by providing a convex surface over which the films must travel on their way past the printing aperture.

The radius of this surface is such that when the positive and negative films are in position upon it, with the positive film on the outside, the greater length of the positive film is counterbalanced by the increase in length of its arc over that of the arc of the negative film. The perforations in the two strips of film are thus made to register perfectly and all creepage or slippage of film, because of shrinkage, are eliminated.

This outstanding and revolutionary feature, added to very cleverly devised film and light controls, are further proof of Mr. Howell's versatile inventive genius.

A very convenient time and labor-saving slicing machine was the next of Mr. Howell's contributions. During the twenty-five years that Mr. Howell has devoted solely to the improvement of motionp icture equipment, he has given the Industry a number of other machines, attachments and improvements, each one of which stands as an outstanding page in the Book of Motion Picture Progress. The great popularity of motion pictures in general brought about rather recently a considerable expansion in amateur cinematography, and here again we find Mr. Howell foremost in the invention, designing and manufacturing of apparatuses, which although devised for use in connection with sub-standard film and for home consumption, present nevertheless all the characteristics of perfection of execution which made the professional equipment to be recognized throughout the world.

It was Mr. Howell that first could idealize an automatic camera of extremely reduced proportions, which could effectively function at a terrific speed of 128 pictures per second. We mention this 16 millimeters ultra-speed camera because in all its outward appearances it does not differ from the well-known *Filmo* 16mm. *Amateur Camera*, and because this speedin its operation was made possible only by thoroughness of Mr. Howell's conception.

It is worth mentioning that all progresses and advances made by the Motion Picture Industry were immediately adapted by Mr. Howell to the equipment already in existence. This is, to the writer, the most flattering tribute that could be paid to Mr. Howell's foresight. It is truly remarkable that a camera which was designed in 1907 and 1908 could be with but minor alterations successfully adapted to the intricate exigencies of the projection of sound pictures of 1929.

Today Mr. Howell is busy at work in his office and in his completely equipped private laboratory in a new exclusive engineering building, recently erected by the Bell & Howell Company. A staff of 200 engineers and technicians are collaborating with him, guided and inspired by his extremely active intellect. While the six story production plant, employing over 1000 employees, are manufacturing the proven devices of the engineering laboratories, perhaps he is busy working on a new accessory for the *Filmo* camera—maybe on some new development for the professional industry—but we may rest assured that whatever is the object of this concentration, his contribution to the art of cinematography is worthy of note, worthy of the man, and worthy of the motion picture industry.

His keen understanding of the problems involved in mechanical science of motion pictures has carved for him a niche in the Motion Picture Hall of Fame and his unassuming personality has gained for him the respect and the affection of all who have been privileged to come in contact with him.

The *American Society of Cinematographers* is honored that Mr. Howell has accepted a Life Honorary Membership in its fold, and with pride and gratitude inscribes his name in golden letters alongside of the names of Mr. Thomas Alva Edison and Mr. George Eastman, who by their remarkable genius have brought comfort and happiness to millions of struggling humans.

The Emotional Appeal of Color

An Unusual Discussion of the Artistic and Emotional Reactions to Color From the Pen of a Distinguished Scientist.

By Loyd A. Jones

This article is the second part of a paper, "On Tinted Film for Sound Positives," presented at the Spring meeting of the S. M. P. E., New York City, May 6-9, 1929. This paper explains in detail the new Sonochrome Film announced by the Eastman Kodak Company, which is supplied in Sixteen tints. The first part of the paper, printed in our July issue, dealt with the objective or physical characteristics of tinted positive film base. This part takes up the artistic and emotional. This paper is also Communication No. 393 from the Kodak Research Laboratories.—Editor's Note.

The application of these colors to a motion picture production involves the consideration of a radically different group of relationships belonging to that phase of the motion picture industry which has been designated, for want of a better term, as artistry.[2] While it may be presumptious on the part of the author of this paper to invade a field so remote from that of his accustomed activities, he feels that there may be some members of the Society more concerned with the artistic and emotional reactions than with the cold facts of scientific technology, who may be interested (or perhaps amused) by some thoughts and suggestions as to the possible emotional and artistic value of color applied to the motion picture screen.

Loyd A. Jones

Some of you may have been present on one or two previous occasions when the author has had the privilege of presenting to this Society papers discussing the use of color[3,4] in more or less abstract static and dynamic forms as a valuable element in a motion picture program. You are already aware therefore that he has long been interested in the possibilities of color as an aid to the creation of dramatic atmosphere. In fact he is firmly convinced that color, *per se*, if properly employed may exert a powerful influence on the emotional reactions. He therefore begs your indulgence while in the following pages a few ideas along these lines are presented for your consideration.

The literature pertaining to the language, symbolism, and emotional effects of color, though scattered and fragmentary, extends over the entire period of recorded history. Mythology is replete with the symbolism of color. On the Greek stage the colors of the costumes were adjusted to the mood of the action. Color is intimately associated with the entire history of the Christian Church and a very definite color symbolism has developed. Color has been so inseparably linked with sensory experience throughout the evolution of mankind that it has acquired by objective and subjective association definite and important emotional value.

No attempt can be made within the confines of this paper to give anything approaching a complete bibliography of the subject. One or two references, however, may be valuable to those interested. Field in his *Chromatography*[5] discusses various colors from the standpoint of their emotional value and gives numerous references tending to show rather general agreement as to the character of such effects. A quotation given by Field[6] from Opie,[7] an English artist of the late 18th century, is of particular interest.

"Every passion and affection of the mind has its appropriate tint; and coloring, if properly adapted, lends it aid, with powerful effect, in the just discrimination and forcible expression of them; it heightens joy, warms love, inflames anger, deepens sadness, and adds coldness to the cheek of death itself."

The most recent, complete, and by far the best publication on this subject is that by Luckiesh.[8] This is a carefully considered conservative treatment in which are given numerous data collected from many fields along with the valuable contributions of the author to this subject. The book will repay careful study and is earnestly recommended to the attention of those interested. The following quotation[9] is of interest as it indicates the attitude of the author toward the subject and is an admirable of the point of view which should be taken by any investigator statement of the point of view which should be taken by any investigator in a little known field.

"It would be unscientific to deny the existence of a language of color because we do not understand it thoroughly at present and quite unprogressive to reject the possibility of finally completing the dictionary of this language. Color experiences are indeed very intricate at present but it is likely that this is due to our scanty knowledge of the elements and processes involved in the emotional appeal of colors, and to our inability to interpret and to correlate properly the various factors. Much knowledge must be unearthed before a rudimentary dictionary of this language is available but first the scientific attitude should admit the possibility that the language of the group of experiences associated with color eventually will be understood."

In considering color from this point of view it must be remembered that we are now dealing with color as it appears, that is, the sensation evoked in consciousness, rather than with the objective character of color as determined by its physical characteristics. All of the various factors, therefore, which determine the character of the subjective reactions, such as simultaneous contact, previous retinal excitation, and many others must be considered in attempting to define the emotional reaction that may be induced by subjecting the eye to stimulation by radiation of known physical composition. Moreover, a color may, just as a word or phrase, have more than one emotional value or significance; and, as in the case of the spoken language, the intended meaning must be determined by the contextual factors such as general character of the scene structure, subject matter of preceding sequences, type of dramatic action, etc. For instance, a green matching in hue and saturation characteristics the color of spring foliage, may connote by direct subjective association, springtime, trees, grass, gardens, etc. Used on radically different types of scenes, however, such for instance as interiors, it may be found particularly valuable for suggesting by indirect or subjective association certain more abstract concepts, such as youth, freshness, hope, aspiration, and those moods closely linked in our consciousness with the springtime of life.

A rather careful analysis of the admittedly rudimentary color language indicates that the great majority of existing connotations may be classified in two rather distinct groups which may be designated as: (a) direct objective association, and (b) indirect subjective association. It is relatively easy to quote many examples of the class *a* correlations. For instance, sunlight is quite definitely suggested by yellow. Now, as a matter of fact, sunlight is not yellow and it has been shown definitely that when the retina is exited by sunlight or by radiation of identical spectral composition in a visual field from which all possible contrasting areas have been removed, the sensation evoked is hueless, that is, corresponding to gray or white. A white object, however, illuminated by sunlight under a clear blue sky appears yellow. It seems quite evident, therefore, that through centuries of evolution a definite conscious or subconscious relationship between sunlight and yellow has been so established that under artificial conditions yellow almost invariably suggests sunlight. Thus a motion picture scene printed on yellow base, such as tint No. 6 (Sunshine), should definitely suggest sunlight illumination whether it be an exterior flooded with light from the sun or an interior into which light is streaming through open doors or windows.

In a similar manner there seems to be a very definite relationship between other colors and the well known artificial sources of heat and light. Artificial illumination of interiors is definitely suggested by a color which is either more saturated or has a hue somewhat more orange than the yellow suggesting sunlight. Firelight may be suggested by a color even more reddish in character. Such examples of objective association can be multiplied almost indefinitely. Subjective associational relationships are somewhat more tenuous and difficult to establish with certainty. Some of these undoubtedly have been built up in consciousness by somewhat artificial association of certain colors with definite emotional states. Others of these correlations may probably be traced to extensions of more direct associational factors. For instance, there seems to be a character of warmth associated with all of the colors in the yellow, orange, red, magenta category; while the remainder give a definite impression of cold or coolness. This is very probably an extension of the

Table III

Total Number of Replies from 63 Subjects Indicating Three General Types of Mood-Reactions Due to the Twelve Different Colors

	Exciting Influence	Tranquilizing Influence	Subduing Influence
Crimson	41	0	10
Scarlet	56	0	0
Deep orange	59	0	0
Orange-yellow	55	6	0
Yellow	53	6	0
Yellow-green	14	39	5
Green	28	32	0
Blue-green	32	23	6
Blue	11	21	30
Violet-blue	0	17	45
Violet	0	6	54
Purple	3	1	48

Table III. Well's data of the affective influence of various colors.

more direct associational value arising from the color of sunlight and fire and the atmospheric conditions normally associated with coldness.

The association of color with certain temperamental phases of life, such as youth, maturity, old age, etc., can probably be traced to an extension of a more direct association with the seasons of the year. Space does not permit us to carry this analysis into greater detail, but a serious study of this subject can hardly fail to convince the fair-minded student that there is really some definite and psychologically sound relationships between colors and emotional states.

Although a great deal of the work on this subject has been of purely qualitaive, and perhaps temperamental type, there are available some rather definite and significant data. For instance, Luckiesh [10] (*loc. cit.* p. 200) gives some very interesting data compiled by Wells[11] relative to the general types of mood reactions produced by twelve different colors. These data are shown in Table III. They are derived from sixty-three subjects and the correlation is indeed striking. There seems to be no escape from the conclusion that these colors designated as yellow, orange-yellow, deep orange, scarlet, and crimson have a definitely exciting influence. In the mid-spectrum yellow-green, green, and blue-green, seem to be definitely tranquilizing or soothing. Blue, violet-blue, violet, and purple are depressive or subduing. The student who approaches this subject with an open mind and with the intention of seriously searching for correlation factors can scarcely fail to be convinced that there is something of a very tangible nature which can be ascribed to a definite psychological reaction to color.

The chart in Fig. 7 shows the affective values of the various colors as computed from Wells' data. No definite information is available relative to the dominant wave-length of the colors used by him so they are plotted arbitrarily at equal intervals along the base line. The ordinates are computed from the data in Table III, each number being reduced to a percentage of the total number of decisions. The curves have the following significance:

A, curve of exciting influence;
B, curve of tranquilizing influence;
C, curve of subduing influence.

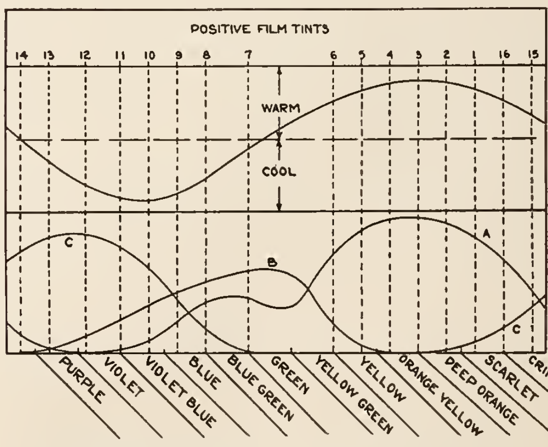
These curves are surprisingly similar in general shape and position to the three fundamental retinal excitation curves for red, green, and blue-violet. Although the present data are too meager to establish any correlation between emotional effect and the retinal processes, the similarity is certainly sufficient to encourage some further consideration.

Along the top line of the chart are placed the numbers referring to the positive film tints, the position of each relative to the color scale at the bottom being determined as carefully as the qualitative data will allow. The dotted lines dropped from these points out the three curves and the heights of these ordinates give some idea of the character and strength of the mood reaction which each color may be expected to induce.

In the upper part of the chart is drawn a curve showing in a qualitative way the position of the warm-cool mood reaction scale. This, it must be confessed, is based on very insufficient evidence, being determined by the rather casual judgments by a few observers working under poorly controlled conditions. In the following paragraphs an attempt has been made to give a brief description of the visual and psychological characteristics of the film tints. It is evident that no very definite statements can be made or rigid specifications set up for the use of these colors. It is hopes that these rather disconnected and rambling remarks relative to the various colors may be of interest to those concerned with working out the application of color to the motion picture screen and serve as a foundation, however insecure, upon which something of real value may be built by others more qualified by training and temperament for such work. Although these characterizations of the symbolic and emotional values of these colors are necessarily tinged by the author's own reactions and by the results of his own introspective analysis, they are based, in so far as is possible, upon a careful summary and integration of data derived from the available literature. They should therefore represent approximately the reactions to be expected from the average observer.

Tint No. 17, Argent. This is a hueless color, a silvery gray showing no chromatic characteristics. It may be regarded as the zero or starting point on the scale of saturation or color strength. It is very necessary as a means of establishing a visual accommodation in terms of which a hue may be appreciated by contrast. It may be used to fatigue the eye to the point of monotony after which the presentation of a hue will have enhanced effect.

Tint No. 6, Sunshine. A clear brilliant yellow approximately complementary to sky-blue, therefore quite closely matching the



from Table III: A, curve of exciting influence; B, curve of tranquilizing influence; C, curve of subduing influence.

subjective color of sunlight when seen in contrast to blue sky. The visual transmission is high, 83 per cent, therefore it is particularly adapted for use on a scene designed to give the impression of brilliant sunlit conditions and where an interior is obviously illuminated by sunlight entering through windows and open doors. This color is definitely warm but not to the same extent as Candleflame. Firelight (*Continued on Page 36*)

A.B.C. OF SOUND PICTURES

By JOSEPH A. DUBRAY, A.S.C.

(Fifth Paper)

Jos. Dubray, A.S.C.

IT HAS been previously stated that an electric current is always surrounded by a magnetic field. This field has a magnetic influence upon the medium in which it flows. If an insulated wire is coiled and a steel bar is inserted and held suspended between its coils, no phenomenon is apparent, but if an electric current is made to flow into the wire, the steel bar becomes magnetized.

The process of magnetization is caused by an electric displacement in the medium surrounding the conductor. The amount of this strain is called the "Magnetic Flux".

The influence that the magnetic flux exerts upon bodies in a neutral state is called "Induction".

If the electrified body possesses electro-kinetic energy the phenomenon of induction gives rise to an electric current in a neutral circuit placed in its proximity. This current is termed "An Induction or Induced Current."

If coils of insulated wire are inserted between two masses of soft iron, or any other metal characterized by great magnetic permeability, that is to say, having the power of becoming easily magnetized, and the current of a battery is made to circulate in the wires, the two metallic masses become magnetized, one with one polarity, and the other with the opposite polarity. If, instead of passing an electric current in the wires, these are made to move across the magnetic field existing between the opposite poles of a magnet, a series of alternatively positive and negative currents, that is to say, currents which flow alternatively in opposite directions are produced.

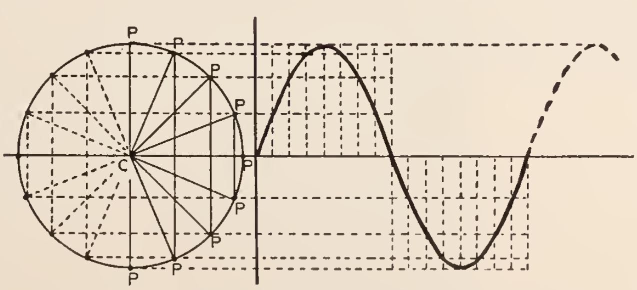
The induced currents, thus produced, reach a certain maximum value first in one direction, and then in the opposite, and they have a value of Zero at certain instants in the intervals between the maxima.

If this cycle of values is repeated during a certain time the current is called "Periodic" and the number of periods or cycles which occur during one second of time is called the "Frequency" of the current. The ordinary dynamo is based upon this principle.

Alternative currents are referred to as "Low Frequency" or "High Frequency" in reference to their number of frequencies. High frequency currents are characterized by some thousands periods per second. Currents possessing these characteristics are called "Alternating Currents" in opposition to the "Direct Currents", such as those produced by batteries, and which constantly flow in one direction only.

In one extremely important case where the quantity of electricity of an alternating current, which is transferred in one direction, is equal to the one transferred in the opposite direction, the alternating current may be graphically represented by a curve having the mathematical form of a Sine Wave.

The name of Sine Wave is derived by the fact that the amplitude of the curve and, therefore, the electro-motive force represented by it, is proportional at any instant to the trigonometrical function called the "Sine" of the angle PCP and which serves as a means by which a mathematical value can be expressed for the angle. Currents which vary periodically, but in which the quantity of electricity flowing in one direction is greater than the quantity which flows in the opposite direction, are called "Pulsating Currents." Pulsating currents are produced either by ratifying alternating currents, or by varying direct currents, or by superposing an alternating current upon a direct current. It is quite obvious that *the strength* of an electric current is dependent upon the electro-magnetic influence of the field surrounding the conductor in which the current is generated.



Drawing illustrating graphically the mathematical form of the Sine Wave

In the matter of sound transmission, and later of sound reproduction, magnetism played the most important part. The invention of the telephone is outstanding in this field. It is quite obvious that the induction current generated in a telephone transmitter, as discovered by Graham Bell, would be rather small and the losses suffered through the resistance of the conducting wires would limit to a great extent the distance at which telephonic communications could be held. It was soon discovered, however, that if a current could be made to flow in the wires the induction current, created in the transmitter, could be superposed to the continually flowing current and at the receiving end currents of sufficient strength could be obtained, even at great distances, to operate the diaphragm of the instrument. It was, nevertheless, found necessary to amplify the strength of this current and up to recent years the only electrical amplifier available was a combination of telephone receiver and carbon transmitter, based upon the variable resistivity of granules of carbon.

Carbon is a semi-conductor the resistance of which is diminished by compression, and vice versa, diminution of its compression increases its resistance. In the telephone, the minute alteration in the compression of the carbon, and consequently, the electrical resistance of the circuit, vary in accordance with the sound waves which control the action of the diaphragm. This apparatus produces, however, only a very small increase in the strength of the current and the reproduced sound cannot be distinctly heard unless the receiver is kept very close to the ear. Due to its construction it is also necessary, at the transmitting end, to hold the apparatus quite close to the lips in order to impart vibrations of sufficient amplitude to the diaphragm.

It is quite obvious that these limitations had to be eliminated in the developing of the transmission or reproduction of sound as it is understood today and practiced in radio and sound pictures.

The main principle of the systems of sound recording and the reproduction may be summarized as a transformation of sound waves into an electric current, which electric current, in turn either actuates a phonographic stylus or is transformed into light energy, modulated in accordance with the modulation of the current itself; or, finally, actuates either a mechanical or an optical valve, also in accordance with its modulations or differences in strength.

High frequency currents of Sine Wave form, and possessing great steadiness, may be generated by instruments, the invention of which is of recent date and which play an essential part in sound recording and reproducing apparatuses, as well as in radio transmission.

We refer to the Three Electrode Vacuum Tube. This remarkable invention became available only within the past few years and its extremely important properties as a generator, a detector and an amplifier of high frequency currents, coupled with its extreme flexibility and constancy, afforded the solution of the problems which confronted the early researchers in the art of sound recording and reproduction.

The vacuum tube also called "The Electron Tube" con-

(*Continued on Page 20*)

Sound Men and Cinematographers Discuss Their Mutual Problems

Sound Experts from Hollywood Studios Are Guests of A. S. C. at Meeting Held to Bring About Better Cooperation and Understanding.

AIMING to bring about a better understanding of the problems of the sound engineers and the cinematographers, the American Society of Cinematographers had sound engineers from the various studios of Hollywood as guests on the night of July first.

Perplexing questions that have been facing both groups since the advent of the talking pictures were brought up for discussion and given a thorough airing. The result was that the members of the A. S. C. and the sound engineers went away from the meeting with a better understanding of the other's problems, and with a spirit of cooperation bubbling over within them of such magnitude that it seems inevitable that a distinct benefit will come to the entire motion picture industry.

This special meeting was conceived by President John F. Seitz of the A. S. C., who, with members of the Research Committee, worked for several weeks on the preparations. Always a leader in every movement for the advancement and betterment of cinematographic matters, the officers of the A. S. C. felt that such a meeting would be of infinite value to the industry and, judging from the discussions of the evening, they were not wrong.

Seven outstanding parallel questions dealing with sound and cinematography were brought up for discussion and were threshed out with a spirit that was refreshing in its frankness and which gave enlightenment to all concerned.

The parallel questions taken up follow:

1. *Photography:* What would you consider an ideal condition for achieving perfect photography?
   Sound: What would you consider an ideal condition for making a perfect voice record?
2. *Photography:* Since ideal photographic conditions cannot now exist as they did when the picture alone was to be considered, what can the sound men do toward the approximation of this ideal photographic condition for you?
   Sound: Since this ideal condition for recording cannot be completely atained in making a talking picture, what can cinematographers and others concerned in making the picture contribute toward the approximation of this ideal condition?
3. *Photography:* Are arc lights ever indispensable to the making of a good picture or to the achievement of a desired effect?
   Sound: Are arc lights equipped with choke coils just as satisfactory to the sound men as incandescent lamps?
4. *Photography:* Do camera booths seriously impair your photographic quality, and is silent camera a probability of the near future?
   Sound: Would it be possible to use electrical filters in the lines to "cut out" the frequencies caused by camera noises—this would be a step toward taking the cameras out of the booths?
5. *Photography:* Can a simple, effective and business-like method be devised for masking the microphone?
   Sound: Can a microphone be developed to enable higher placement above the heads of the characters?
6. *Photography:* What particular hardship is inflicted upon the cameraman who is forced to expose and arrange his lighting to secure the proper pictorial balance and contrast, when development is designed to secure an overall Gamma of Unity which is considered the proper development for perfect sound reproduction?
   Sound: What steps can be taken to bring about a closer and more balanced exposure between picture and sound track so that the film may be developed for the picture, but at the same time be perfect development for the sound?
7. *Photography:* To what extent would cinematography be benefitted by the development of an entirely satisfactory directional microphone?
   Sound: What are the disadvantages, if any, in the use of directional microphones?

Miscellaneous Questions

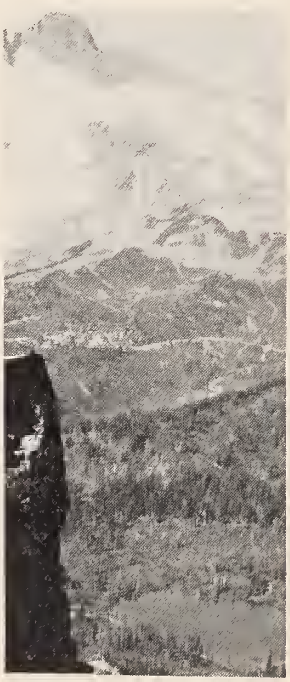
Are there any indications or possibilities that at some time in the future all recording will be done with either wax or film, or that all recording will be made on film and duped or reproduced on wax?

Briefly, the following outstanding points were brought out: Question 1.—(a) An ideal photographic condition exists when we can place our lights and cameras at any desired point, or work without any restrictions whatever.

(b) An ideal or location for making a perfect vocal record would be in the middle of the Mojave Desert, unhampered by cameras, walls or any other disturbing elements.

Question 2.—(a) The sound men could assist the cinematographers by endeavoring to cover from fewer angles in a single set-up. The closer the cinematographer could approach the condition existing before the advent of "talkies," other things being equal, the better his photography should be.

(b) The cinematographer and director could assist the sound engineers in approximating ideal recording conditions if they could arrange their work so that the microphone could be placed from 18 inches to three feet from the actors' heads, by keeping the number of microphones used as low as possible, and by covering fewer angles, except in instances where music is being recorded. In the latter case, owing to the difficulties of maintaining a perfect sound level through a number of scenes when they are broken into shorter lengths, it is advisable to take all the required scenes in one set-up.



Question 3.—(a) Arc lights are at times indispensable to secure a desired effect. If you wish to obtain clear, sharply defined shadow for some specific effect this cannot be satisfactorily obtained with an incandescent lamp, due to the nature of its source. In a very large set, having much detail, arcs are desirable for the sharp actinic qualities. These are exceptional cases but illustrate the point that at times arcs are necessary.

(b) Arc lights equipped with choke coils are fully as satisfactory to the sound men who have used them as incandescents. One studio expressed a decided preference for arc lights, maintaining that tests showed that the spherical shape of the incandescents gave certain echoes that did not exist with the arcs. The arcs, being covered with plain or Florentine glass gave a flat surface, they explained and prevented the echo.

Question 4.—(a) Camera booths seriously impair photographic quality. In photographing through glass it is practically impossible to eliminate chromatic abberations. In addition one cannot always eliminate reflection. (a, 1) Camera manufacturers are steadily progressing toward the realization of a silent camera, but it is problematical as to when this will arrive.

(b) The principal difficulty here is that each camera would have its individual frequency. A filter would have to be fitted for each camera. Further than that a (*Continued on Page 39*)

"SUCCESS"

A Short, Short Story of the Movies

By Hal Hall

Illustrated by John Corydon Hill

NOTHING doing today, Pop," said the casting director. "Call me tomorrow. Maybe better luck then." The old man shuffled along to the outer door of the studio, and with a backward glance, almost akin to despair, buttoned his threadbare overcoat around his neck and made his way out and through the snowdrifts of the Bronx to the subway.

At the casting office of the Luxury Motion Pictures Corporation the old man was listed as: "Charles Stamwell . . . character atmosphere . . . limited wardrobe." Among those in the know at the studio it was whispered that the limited wardrobe had several times deprived him of a small part. But that is neither here nor there, and is the way of the movies.

For five years he had been an almost daily caller at the studio. He had some bits of luck: periods when he worked maybe two weeks at a time for five to seven and a half dollars a day. Old men, with long, white whiskers are not in great demand in pictures, even as just plain "atmosphere." So, generally, the old man was unemployed. How he lived none of the vain, chattering, cosmopolitan group of "extra" folk neither knew nor cared. Most of them put him down as just a doddering, old simp who thought he could be a "movie actor."

"Why don't you quit the acting business, Pop?" the casting director once asked him.

"Because I am going to succeed some day," he answered, after a moment's pause. "I have failed at about everything else all my life. I even failed to hold the most beautiful—oh, Hell!—What do you care about it anyway?" That was the only time he ever spoke about his past or future.

That the old man had nerve he proved one day during the shooting of scenes aboard an ancient freighter some fifty miles off Sandy Hook. The ship was supposed to catch fire and then blow up when a cargo of gun powder was ignited. A special band of "extras" had been secured to leap from the top deck to the water, forty feet below. Somehow or other the old man found himself in this group when the director told them to jump. Instead of spoiling the scene by running away, the old fellow leaped into the sea.

It was not until he had been fished out, half drowned, that the movie people learned he did not know how to swim.

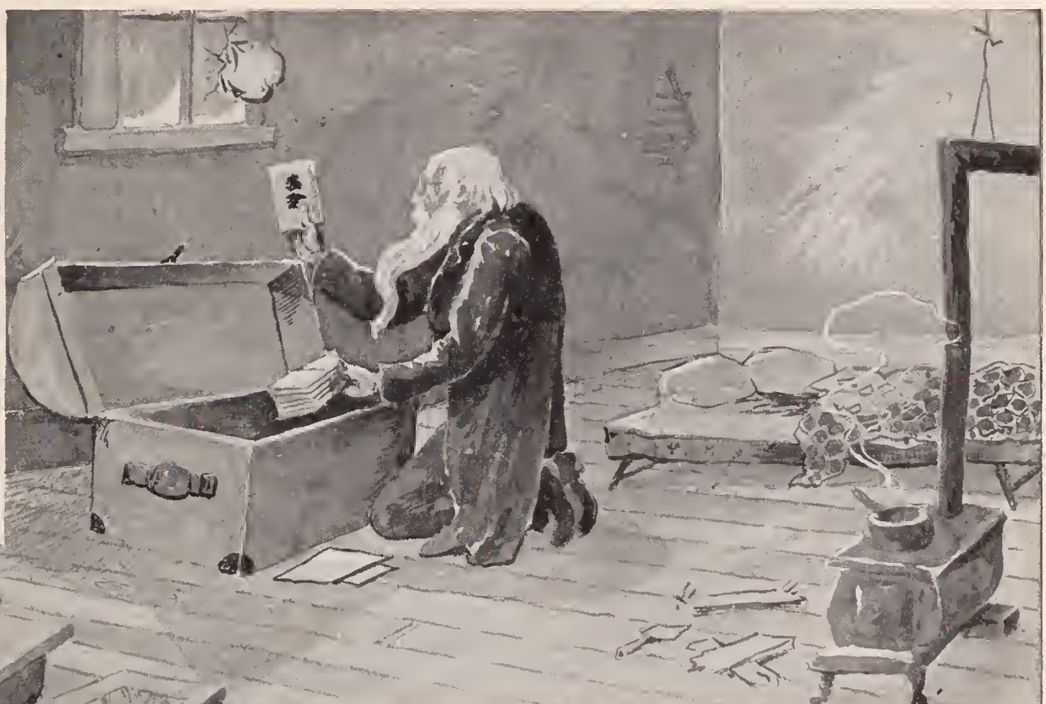
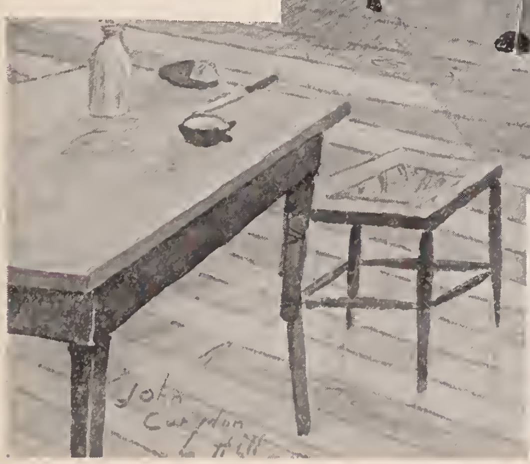
THE long journey to the studio and back, with difficult walking through the snow at either end, taxed the old man to the limit. When he reached his little room in a squalid, crowded tenement in New York's lower East Side he was near exhaustion. With wood from some old broken boxes he kindled a tiny blaze in the little stove that furnished the only heat for this place he called home. When the fire burned out he curled up on his little cot and dropped to sleep with the pangs of hunger gnawing at his stomach. But he was accustomed to that.

WEEKS passed, and with the appearance of crocuses in the parks came new hope in the breast of the old man who stubbornly hung on and refused to admit defeat. Came a bright May morning, and the old man was called to the telephone in the delicatessen store around the corner. It was the casting director of Luxury Pictures on the phone. "That you, Pop?" came the voice over the wire. "Got something big for you this time. A real part. Not atmosphere. This is a regular part. Screen credit and all. Get that, Pop? You're in luck. Why don't you say something, you old greybeard?

"When do I begin?" asked the old man, whose face had turned ashen and whose hands shook as with palsy.

"Two o'clock this afternoon, and don't be late. So long."

Back in his little room the old man knelt before his cot and prayed silently. Rising, he cleared away (*Continued on Page 43*)

For a long time the old man gazed at the picture.

As the Editor Sees It

Honor Where Due

PERHAPS no single individual contributes more to the artistry of a motion picture than does the cinematographer. The author may be famous, the scenarist the best in the industry, the director at the head of his profession, and the players all stars, but—what the audience sees on the screen is a picture, and if it is not photographed well the artistry of the above-named workers goes practically for naught.

It is a well-known fact that good photography can—and frequently does—save a mediocre picture. Without causing embarrassment by mentioning names, the writer recalls numerous pictures which have been successes solely because the photography was so wonderful that the audience forgot the poor story and poor acting and ordinary direction.

In other words, a cinematographer is the most important factor in the making of a picture. A director may have freak ideas, but it is the cameraman who puts them over because of his knowledge.

However, the least publicized individual in the picture industry is the cinematographer. Even the prop boy and the wardrobe mistress come in for "breaks" in the papers, but the cameraman usually gets as his reward only the satisfaction of knowing he did a splendid job.

As a whole, this writer believes that the general public is interested in the cameraman—at least as much as in the minor studio officials who come in for much in the way of publicity blurbs. For years this writer has been finding a great deal that is truly of interest in these hard-working artists, and when magazines have printed his stories about the cameramen there has been no uprising against the publications by the public. And so, we wonder why the unusual and often adventurous exploits of these men are not publicized by those who write publicity for the studios.

Surely the public that has gasped over the marvelous effects of "Noah's Ark" would be interested in reading something about Fred Jackman, whose genius gave the picture the marvelous flood effects, and who can take a pail of water and a few twigs and create a forest wilderness with a lake in it. Surely the public would be interested in Hal Mohr, the chief cinematographer on that picture as well as the chief cinematographer on "Broadway," which is now being hailed as a photographic triumph by critics throughout the country. Most of the critics perhaps do not even know who photographed the picture.

Then, there was "Sunrise"—Charles Rosher and Karl Struss were awarded high honors by the Academy of Motion Picture Arts and Sciences. But how many people knew they photographed it! Surely, a word or two about the work of these men would not be amiss, and studio publicity writers would still be getting the name of their pictures in the press.

Because of the unusually interesting experiences and background of these men the editor of this magazine is giving a feature story each month about them, and an expression of opinion from our readers will be welcomed. Write us and tell us if you like them, and if you don't.

There are countless cinematographers of extraordinary merit who rarely receive a line of any sort in the press. John W. Boyle, John F. Seitz, Sol Polito, Clyde DeVinna, Ross Fisher, Charles Clarke, Dan Clark, Victor Milner, John Arnold, Tony Gaudio—these are just a few. And our readers will hear more about them later.

Cinematographic Annual

WE TAKE this opportunity to announce that the American Society of Cinematographers, publishers of the AMERICAN CINEMATOGRAPHER, will issue a Cinematographic Annual in 1930.

This annual is to be more than a mere "yearbook." It is to be a work of real art, and a book that will be worth its weight in gold to every individual interested in cinematography, professional or amateur—to say nothing of its value to sound engineers and all those who play a part in the divers arts and sciences connected with motion pictures.

From the point of view of appearance, the annual will be a thing of distinctive and dignified beauty—a book that can take its place in any library and be outstanding.

As to its content—only a volume of great size could fully tell you of this. There will be every formula and table that any professional or amateur cinematographer could ever want. There will be feature articles by the greatest scientists of today, dealing with every phase of cinematography, sound, laboratory work and all allied arts and sciences.

Detailed reports of the technical meetings of the A. S. C. will appear in full. The reports of the A. S. C. Research Committee will be found there. In short, inside the pages of the book will be found material such as the cinematographer and those of allied arts can find nowhere else. Instructive articles by men who daily are creating and giving the industry its very life-blood.

The S. M. P. E.

NOTHING could give us more pleasure at this time than to say a few words anent the Society of Motion Picture Engineers, the organization which provides for this magazine some of its most valued and interesting articles—the S. M. P. E. Transactions which we print from time to time.

The S. M. P. E. was organized in 1916 by a group of men who always have been struggling to further the advancement of the science of motion pictures. Its Constitution tells its object in the following well-chosen words, same being to further "The advancement in the theory and practice of motion picture engineering and the allied arts; the standardization of the mechanisms and practices employed therein, and the maintenance of a high professional standing among its members."

With such a motive for being, it is no wonder the S. M. P. E. has grown and has made its influence felt in all parts of the globe. Constantly on the alert, the society strives to keep its members not only abreast, but ahead, of the times, and its list of transactions present a library of motion picture science practically unrivalled in completeness. The publication of these Transactions has a tremendous permanent appeal, and many of them are even translated and reprinted in publications abroad.

Various committees collect and present to the society the latest data on subjects they are examining, and the Standards and Nomenclature Committee is constantly bringing about organized and uniform methods and equipment instead of the unstandardized chaos which at one time prevailed.

Like the American Society of Cinematographers, the S. M. P. E. co-operates closely with other engineering and picture organizations with the goal better pictures, better methods, ultimately making for bigger and better business for all concerned.

The S. M. P. E. has been reaching out into foreign fields and its London branch has nearly a hundred members. A special effort is being made to increase the foreign activity and the entrance fees for persons living outside of North America have been reduced to one-half, and the society hopes soon to have many branches in the Old World.

Such a society deserves to expand and spread its good work wherever motion pictures are made.

Cooperation

ONE of the most interesting meetings ever held in the clubrooms of the A. S. C. was that on the night of July first when the cinematographers met with sound engineers from the various studios. Problems that have been bothersome since the advent of talkies were discussed with astounding and refreshing frankness and the result cannot but be of benefit to the industry. Cooperation was the keynote of the evening. It is just this spirit of cooperation that has long been an outstanding characteristic of cameramen. It is one reason why they are so valuable to the industry.


THE AGE OF ALIBI
QUIET
CAMERA NOISE
INTERFERENCE
GROUND NOISE
SILENCE
OLD MAN MIKE HIMSELF
AT LAST -THE IDEAL PLACE FOR MY MICROPHONE
MR LLOYD - WILL YOU TELL HIM TO DO IT OVER - I HAD AN AWFULL GALLOP THAT TIME
WHAT?
13 FN
"BUCKLES" - "GALLOPING MOTORS" - ARE FAST BECOMING GREAT ALIBI WORDS FOR THE CAMERAMAN
YOU'RE MISTAKEN - THOSE BAGS OR HOODS - COVER THE CAMERAS TO DEADEN THEIR NOISE - I'M SORRY TO HAVE YOU SO UPSET
KKK!!
WONDER WHAT'S THE MATTER WITH THAT GUY.
EVEN HORSE BLANKETS COME IN HANDY
NOW YOU GET THIS - UNLESS SOME ONE GETS WISE - THAT'S JUST WHERE THOSE MIKES ARE ALWAYS GOING TO HANG - SEE!!
AWH IS THAT SO - WELL YOU BETTER GET THEM UP HIGHER SO WE WON'T HAVE TO CUT DOWN THE HEAD ROOM TO THEIR EYE BROWS - WAT YOU TRING TO DO - WRECK MY COMPOSITION?
BE CAREFULL DEAR - I KNOW WHAT YOU'RE THINKING - BUT DON'T SPEAK OR THAT MICROPHONE WILL HEAR IT ALL - THEN YOU KNOW THAT SOUND MAN ENLARGES EVERY THING - YOU SAY
BUT LADY LADY TO SIT HERE AT YOUR FEET SCENE AFTER SCENE IN THIS INCANDESCENT LIGHTING IS - OH WHAT'S THE USE
OH!!!
FOR ART'S SAKE
WHAT'S THAT - THE MIXER SAY'S HE FORGOT TO OPEN THE MIKE - WELL JUST GIVE 'EM THE OLD LINE - THAT THE WAX WAS "OVER CUT" THEN TELL THEM THE WAXS ON SCENES 24 AND 25 WERE A LITTLE TOO HEAVY
WAXES OF SCENES 24 AND 25
BANG
MIXERS SURE GET THE BREAKS
SURE ALLIE SAMIE
ME DOIE
BANG
AND EVEN THE MIKE COULD STAND IT NO LONGER
NEVER MIND CHILDREN - THAT DIRECTOR SAID PLENTY OF SCORCHING WORDS BUT YOUR NECKS WILL SOON BE WELL
A LITTLE ERRING (AIRING) MAKES US THINK
GLENN R KERSHNER ASC

Some Properties of Fine-Grain Motion Picture Film Developers

Part Two of a Paper Presented at the Spring Meeting of the Society of Motion Picture Engineers at New York City, May 6 to 9, 1929

By H. L. Carlton and J. I. Crabtree

This is the second installment of Communication No. 388 from the Kodak Research Laboratories, Rochester, N. Y. The first part appeared in the July issue of the American Cinematographer. The third and final installment will appear next month.—Editor's Note.

WHEN Elon is used without hydroquinone with two grams of borax per liter the concentration can be increased to 16 grams per liter. An increase above 4 grams per liter produces very little increase in the rate of development because very little of this is converted to the Elon base which is the active form. If borax is added to convert the Elon into the Elon base, the rate of development increases with the Elon concentration. The gamma produced for a constant time of development oincreases as a linear function of the logarithm of the Elon concentration.

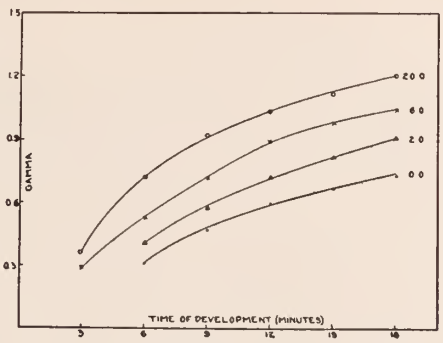


Fig. 4. Time-gamma curves for increasing quantities of borax in the regular formula at 65° F. The borax content is given in grams per liter (Rack and Tank method).

If the Elon is omitted, the hydroquinone concentration can be increased to 15 grams per liter, but the resulting developer has very little developing power. A fair rate of development can be obtained with 10 grams of hydroquinone in the absence of Elon if the borax content is increased to 20 grams per liter (No. 21, Table II). The quantity of Elon and hydroquinone can be reduced to decrease effectively the rate of development. If the quantity of borax is also reduced to 50 per cent (see No. 23, Table II), a developer with the following formula is obtained which gives a still greater decrease in the rate of development.

	Metric	Avoirdupois
Elon	1.0 grams	1.0 lb.
Hydroquinone	2.5 grams	2.5 lbs.
Sodium sulfite (anhydrous)	100 grams	100 lbs.
Borax	1 gram	1 lb.
Water	1 liter	120 gallons

A comparison of the time-gamma curves for this developer (B) and the regular borax developer (A) is given in Fig. 3. This developer can be used very effectively for machine development when the construction of the machine demands a developer that is slower than the regular formula and when fresh developer can be added sufficiently fast to compensate for the depletion of the developing agents.

(2) *Effect of Varying the Alkalinity.*—The alkalinity of a developer may be expressed in terms of the pH value which is the logarithm of the reciprocal of hydrogen ion concentration, viz.:

$$\text{pH} = 1/{}^{C}\text{H}$$

where ${}^{C}\text{H}$ is the concentration of hydrogen ions in the solution.[11] The absolute accuracy of the pH values is open to question, but the measured relative values have been correlated very satisfactorily by a study of the rate of development of experimental developers. Solutions with pH values above 7.0 are alkaline and the alkalinity increases with the pH value. Slightly alkaline developers like the present borax developer lie in the pH range from ate and caustic alkaline developers lie in the range from 11 to 14. 8.0 to 9.0 and the more alkaline developers like sodium carbon-

The pH values were determined by the LaMotte hydrogen ion apparatus which works upon the principle of color change of organic indicator dyes and when used for this purpose may be in error by + 0.1 pH. Developers from Nos. 1 to 6 indicate that the potassium bromide content has no effect on the alkalinity but the alkalinity increases with the borax content and decreases with increased Elon content. The addition of hydroquinone decreases the alkalinity but Elon and borax produce about an equal effect, weight for weight, the former to decrease and the latter to increase the alkalinity of the developer.

The data on the molecular weights of borax and Elon check the above results. Borax (mol. wt. = 381) is dibasic when neutralized by strong acids and is neutralized by one molecule of

Table III

The Gamma and Fog Produced with Varying Concentrations of Borax and Boric Acid in the Buffered Borax Developer

Grams per Liter Borax	Grams per Liter Boric Acid	3 minutes Gamma	3 minutes Fog	6 minutes Gamma	6 minutes Fog	9 minutes Gamma	9 minutes Fog	12 minutes Gamma	12 minutes Fog	15 minutes Gamma	15 minutes Fog	18 minutes Gamma	18 minutes Fog	pH
2				0.41	0.13	0.58	0.16	0.72	0.20	0.82	0.23	0.91	0.25	8.5
14	2	0.31	0.10	0.60	0.15	0.78	0.22	0.91	0.28	1.03	0.35	1.10	0.38	8.9
11	5	0.26	0.07	0.50	0.14	0.66	0.19	0.79	0.20	0.90	0.30	0.97	0.33	8.7
8	8	0.23	0.07	0.39	0.09	0.56	0.13	0.70	0.16	0.83	0.18	0.92	0.20	8.3
5	11			0.30	0.05	0.45	0.11	0.61	0.12	0.70	0.15	0.80	0.16	8.0
2	14					0.36	0.06	0.50	0.09	0.59	0.10	0.67	0.14	7.8

sulfuric acid. Elon crystallizes with one-half mole of sulfuric acid per molecule so that two molecular weights of crystallized Elon (mol. wt. = 172, total weight 344) are required to neutralize one mole of the borax. Consequently, borax and Elon neutralize each other in weight ratios of 381 :344, which substantiates the result obtained from a study of the alkalinities of the developer.

In these terms the borax developer formula is simplified as it actually occurs in solution. The borax and Elon. used in equal concentration (2 grams of each per liter, practically neutralize each other so that the developing solution is essentially a solution of Elon base (monomethyl para-amino phenol) and hydroquinone in a 10% solution of sodium sulfite.

The alkalinity of the developer can be increased by increasing the quantity of borax. Fig. 4 gives time-gamma curves for the regular formula with increasing concentrations of borax up to 20 grams per liter and shows graphically how the rate of development increases with an increase in borax content. If a gamma of 0.9 can be produced in 18 minutes with the regular formula, the same gamma can be obtained in 12½ minutes in a formula containing 6 grams of borax per liter; and in 9 minutes with 20 grams of borax per liter.

A definite control of the alkalinity of the developer can be maintained by adding boric acid and extra borax to the regular borax developer formula. This combination of a weak acid and its sodium salt in the same solution produces a buffer solution, so-called because it stabilizes the alkalinity of the solution. A buffered solution has a potential resistance to chemical agencies which tend to increase or decrease the alkalinity of the developing solution. Since the rate of development changes very much with small changes in alkalinity, the buffered solution tends to stabilize the rate of development.

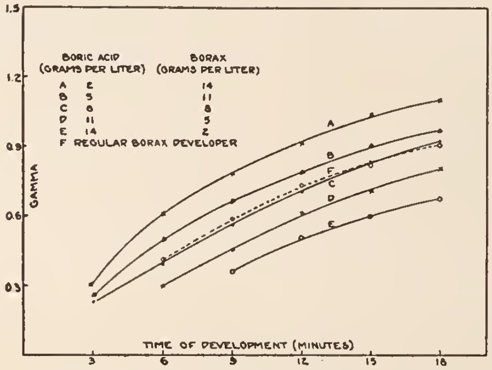


Fig. 5. Time-gamma curves for various proportions of borax and boric acid in the regular borax developer formul at 65°F. (Rack and Tank method).

By using 8 grams of boric acid with 8 grams of borax in the standard formula and then increasing one at the expense of the other, so that the total quantity of the two is kept constant, the alkalinity of the solution and the rate of development can be controlled. The variations in rate of development that can be produced by this method are shown in Fig. 5. With 14 grams of boric acid and 2 grams of borax per liter, a low rate of development is obtained, while with 14 grams of borax and 2 grams of boric acid, a high rate of development is obtained. All degrees of development between these limits can be obtained by interpolating the data in Fig. 5. Neither borax nor boric acid should be used to the exclusion of the other because, if this is done, the solution loses part of its buffering action.

Table III shows the effect, on the rate of development, of changing the concentration of borax and boric acid in the borax developer. Concentrations are given in grams per liter of borax and boric acid added to a solution containing 2 grams of Elon, 5 grams of hydroquinone, and 100 grams of sodium sulfite per liter.

(3) *Effect of Addition of Potassium Bromide.*—Comparison of developers Nos. 1 to 6 (Table II) with a potassium bromide content from 0.1 to 5.0 grams per liter shows that increasing the bromide concentration decreases the amount of development, the fogging action, and the speed of the emulsion. The lowest concentration of bromide gives a slight increase in speed because the fog values are decreased without an appreciable decrease in the general development.

(4) *Effect of Variation of Sulfite Content.*—On increasig the concentration of sulfite from 25 to 100 grams per liter, the rate of development and the speed of the emulsion are slightly increased. Further additions of sulfite decrease the rate of development but the emulsion speed is not affected (Nos. 26-30, Table II). The influence of sulfite on graininess will be discussed later.

(5) *Effect of Addition of Sodium Sulfate.* — Hydrated sodium sulfate has been added to tropical developers to decrease the swelling of the gelatin and the rate of development.[12] Up to a concentration of 100 grams per liter, it decreases the rate of development without decreasing the speed of the emulsion or increasing the fogging action (Table II, Nos. 16, 17, 18). Various quantities can be added to the modified developer recommended above to further decrease its rate of development.

(6) *Effect of Addition of Hypo.*—Comparison of developers Nos. 19 and 26 (Table II) shows the effect of the addition of a small concentration of hypo to a modified borax developer. The addition of hypo decreases the rate of development and the speed of the emulsion. The effect of hypo on graininess will be discussed later.

(7) *Practical Methods of Changing the rate of Development.*—The rate of development can be increased by increasing the concentration of borax as shown in Fig. 4 and to a lesser degree by increasing the concentration of the developing agents if extra borax is added to compensate for their acidity.

The rate of development can be decreased by decreasing the quantity of developing agent, by decreasing the quantity of borax, by adding sodium sulfate, or by any combination of these three methods.

By using the boric acid-borax combination the rate of development can be controlled to produce any desired rate of development within the immediate range of that produced with the standard borax developer.

III. Effect of Age on the Borax Developer
(A) Without Use

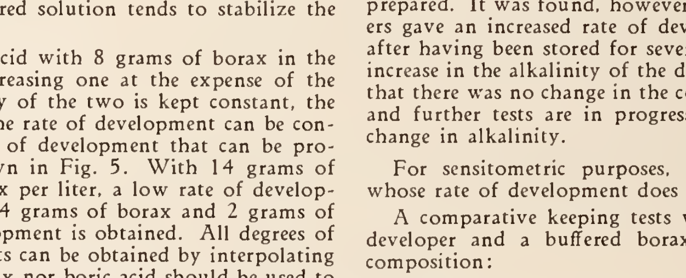
For commercial purposes the borax developer keeps satisfactorily when mixed in large quantities and used soon after it is prepared. It was found, however, that several samples of developers gave an increased rate of development when they were tested after having been stored for several weeks. This was caused by an increase in the alkalinity of the developer. Analytical tests showed that there was no change in the concentration of the sodium sulfite and further tests are in progress to determine the cause for the change in alkalinity.

For sensitometric purposes, however, a developer is needed whose rate of development does not change with keeping.

A comparative keeping tests was mare with the regular borax developer and a buffered borax developer with the following composition:

Elon	2.0 grams
Hydroquinone	5.0 grams
Sodium sulfite (desiccated)	100 grams
Borax	8.0 grams
Boric acid	8.0 grams
Water to	1 liter

The developers were stored in closed earthenware jugs and tested every week by the regular H. & D. mthods. The data obtained is recorded in Table IV. The results for any time of development show that with the regular borax developer the rate of development increased with keeping. The gamma for 12 minutes' development increased from 0.78 to 1.19 in 49 days. With the buffered developer the rate of development remained constant within the limit of error for the 49 days of keeping. For sensitometric purposes which depend upon the development factors remaining constant over a period of several weeks, the buffered borax developer is preferable to the regular formula.



Left, Fig. 6. Characteristic H. & D. curves for 15 minutes development made at critical points in the life of a tank of borax developer. Right, Fig. 7. Exhaustion curves for a 120-gallon tank of borax developer showing gamma and relative speed values for a development time of 9 and 15 minutes. Rack and Tank method at 65°F. in both cases.

The effect of passing carbon dioxide into the developer was to decrease the rate of development. The carbon dioxide hydrolyzed to give carbonic acid which decreased the alkalinity of the developer. Bubbling air through the developer increased the rate of development. This fact is not readily explained, but indicates that the quantity of

(*Continued on Page 18*)

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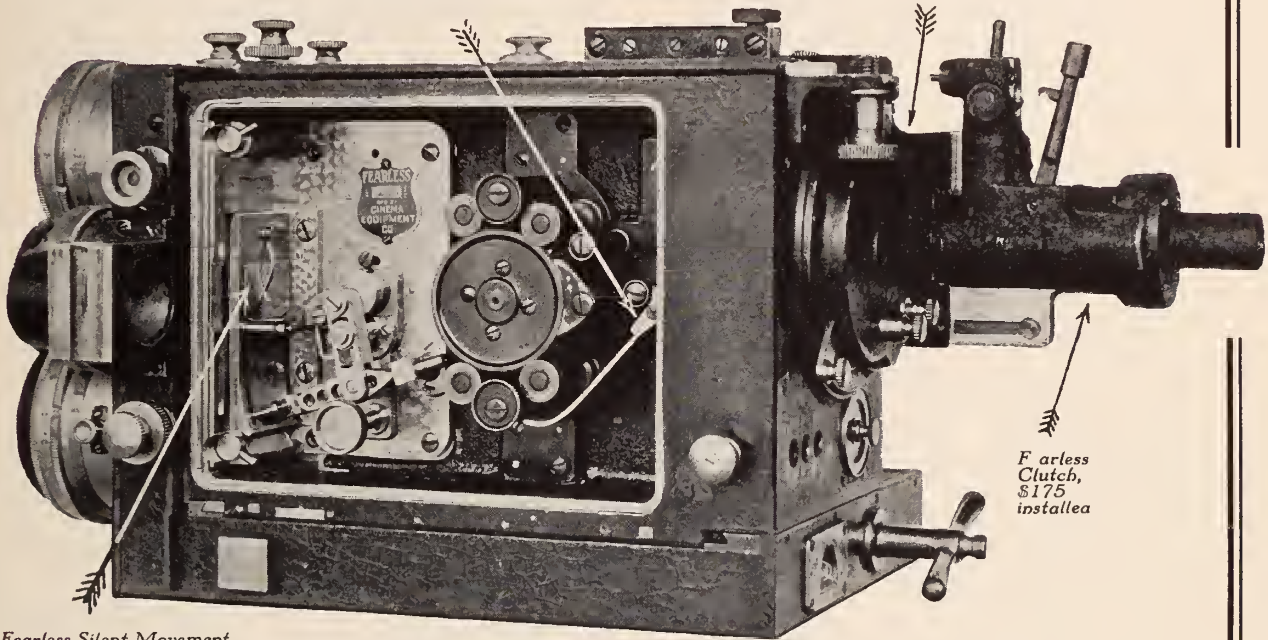

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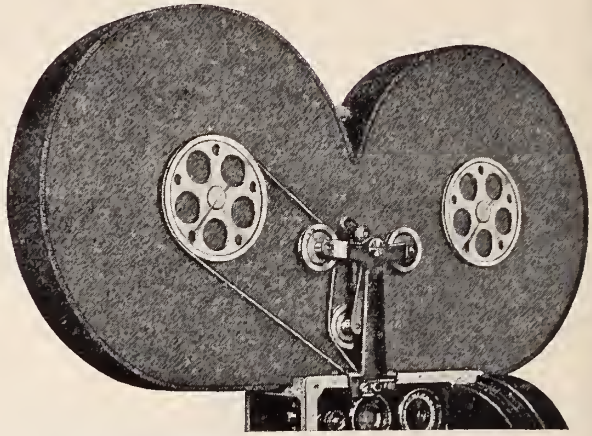
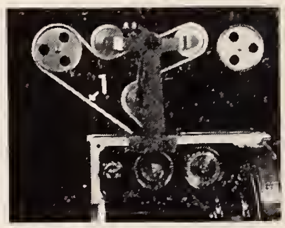
How Bell & Howell *build*

Silence into

SOUND CAMERAS



'Bell & Howell 1000-ft. Sound-Proof Magazine equipped with Silent Belt Tightener that keeps uniform tension on endless fabric belt



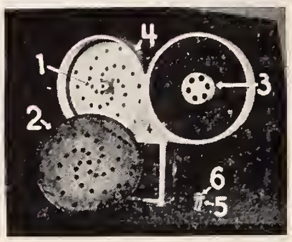
Silent Belt Tightener on Bell & Howell 400-ft. Magazine. 1. Endless fabric belt

Silence . . . and yet mobility!

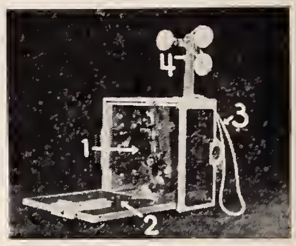
Thus the order came to Bell & Howell engineers and designers. And again there was a demonstration of that great precision and accuracy, that thorough-going engineering skill which has made Bell & Howell a by-word in nearly every major studio.

Felt linings, fiber gears, solid bronze bearings, endless fabric belts, sponge rubber coverings . . . every known method of cancelling, intercepting, and muffling mechanical noises was brought into play. The result is the Bell & Howell Standard Sound Camera, which operates within ten feet of the microphone, *without a booth,* and not the faintest click registers on the sound track.

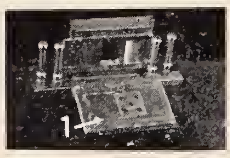
Consultations on any phase of sound-recording installations are invited.

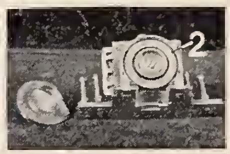


1,000-ft. Sound-Proof Magazine shown disassembled: 1. Sound-intercepting holes drilled in back of magazine drums —2. Front of magazine with rubber cover removed—3. Three-inch spool—4. Rubber outer cover—5. Film roller—6. Oilless film roller bearing



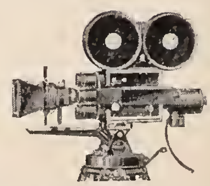
Speed movement of Bell & Howell camera equipped for sound work—1. Check-pawl super-speed movement—2. Felt lining of camera door—3. Endless fabric belt—4. Belt tightener





Bell & Howell check pawl super-speed movement — 1. Driving finger — 2. Formica (fiber) gear

BELL & HOWELL COMPANY



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*W*IDE *I*MAGE ON *S*TANDARD *F*ILM

Hollywood Inventor Claims Method Devised Whereby Image Twice Present Width Can be Made on Standard Film and Projected through Standard Projector

By Captain Ralph G. Fear

President, Cinema Equipment Co., Hollywood

Wide film is an important factor in the picture world today, and several companies are experimenting with various methods. To date, the methods call for special equipment in theatres and elsewhere. Captain Fear claims only the addition of an optical unit to standard projector and camera is only requirement for his method. Due to the unusual claims by the inventor, we have had Captain Fear write his own detailed description and account.—Editor's Note.

WITHOUT doubt, the present size image in the motion picture industry is going to be changed. For years the standard dimensions of the motion picture film has been ¾ by 1 inch. This is projected on the screen through a machine which decreases the picture size to about 45/64 by 15/16 of an inch. It is then enlarged during projection. Since the advent of talking pictures the picture has been decreased in width until it is almost square. Due to this small image enormous light intensity is required under great amplification and film grain shows.

A change is surely coming. The change will be for a larger image. An image that is much wider than the standard width of the present. There are many attempts being made, and wide pictures are going to be the rule of the future.

I have devised a method which I feel is to be the outstanding one of the future. By my method I can produce a picture twice as wide as the present standard image, *and* can produce it on *standard size* film. In addition to making a picture on standard film twice as wide as the present one, the sound track on my method will be twice as long as that of the standard picture, and a stereoscopic illusion will be given that approximates the natural vision so nearly that the effect of realism is startling.

But the outstanding feature of my method, in my opinion, is the fact that while it gives a picture twice as wide as the standard, and gives a sound track twice as long, it requires no new equipment either in the laboratory, theatre or studio. Only an optical unit and an alteration in gears and sprockets need be added to a standard camera to photograph the pictures, and only an optical unit plus a change of gears need be added to a standard projecting machine to make it possible to project the wide image.

In this way an untold amount of money can be saved everyone connected with the making and showing of the pictures, for under the new methods advanced by others, every bit of equipment used from the making of the film to the showing of the finished picture would have to be changed and replaced, with a cost that conservatively would run into millions of dollars. With my system only a slight change is necessary in the camera and projector and the saving is apparent. By reason of this, producers can go into production almost immediately with my system, and will not have to wait months for new equipment.

The chief points of my new method are as follows:

1. It gives larger picture on standard film.

2. Gives a more natural picture on the screen because it more nearly approaches the normal angles seen by the human eye.

3. Gives a wider sound track for recording sound photographically on film, which improves sound record.

4. Gives a sound track approximately twice as long as the present sound track, therefore giving greater sensitivity in recording, because with present light valves the sound record for each vibration is twice as long.

5. Broadens the sound recording scope by giving increased length for recording, thus allowing recording of twice the present frequencies now recorded.

6. Can be projected through standard projectors now in use.

7. Can be printed on standard printers.

8. Standard reels used, also standard developing machines, waxing machines, polishing machines, speed and footage indicators and standard camera magazines.

9. Can be projected in any theatre having present equipment when only a slight alteration is made to projector, and standard cameras can be used with slight alteration.

10. Does not require alteration of present sound equipment.

11. Eliminates so-called "grain" in film, and no trouble with curling, together with comparative freedom from scratches.

12. All of the equipment now in use in studios, laboratories and theatres can be used with only slight alterations to cameras and projectors.

I have given the name "Fearless Super Pictures" to this new type of film, and predict that it will be one of the most revolutionary inventions of the decade.

I get my wide image on standard size film simply by using an optical system in the camera which places the image lengthwise on the film instead of across as is the present system. In this way I can get the desired width without using a wider film as the optical system is arranged so that the picture is thrown on the film to the desired width. Another optical system on the projector projects the image on the screen normally and there is the wide image from the standard size film with no added expense of new equipment.

The pictures are taken upon a standard motion picture film and are approximately .800 of an inch high and 1.813 inches long. The film track is approximately .200 of an inch wide and is on the edge of the film. The picture is photographed, either in a vertical plane by use of an optical system that turns the image through an arc of 90 degrees and places it parallel to the edge of the film, or it may be photographed directly upon the film without the use of the optical system. In the latter case the film runs horizontally past the aperture.

I have applied for patents on all phases of this new method; the method of photography, the film with the combination of a sound track and rectangular picture with the top of the picture parallel with the edge of the film; for a camera suitable for photographing these pictuies; for the method of turning the picture optically from a vertical to a horizontal position for projection; and on the combination of the optical system and projector necessary for turning the picture from the vertical to the horizontal

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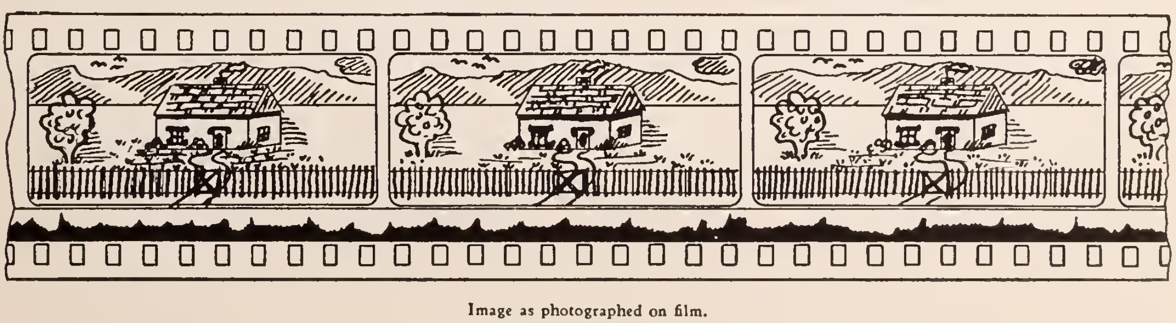


Image as photographed on film.

Fine Grain Developer

(*Continued from Page 14*)

carbon dioxide present in the air has no perceptible effect on the rate of development.

Table IV. Effect of Aging on the Regular and Buffered Borax Developer

Regular Borax Developer

Days	6 min. gamma	9 min. gamma	12 min. gamma	15 min. gamma	18 min. gamma
0	0.50	0.67	0.78	0.92	1.05
8	.53	.74	.86	.97	1.03
14	.51	.71	.89	.96	1.08
22	.60	.73	.91	1.03	1.12
28	.53	.76	.87	1.07	1.17
35	.58	.81	.95	1.05	1.15
42	.67	.92	1.01	1.10	1.24
49	.79	.99	1.19	1.43	1.45
Buffered Borax Developer					
0	0.44	0.61	0.78	0.90	1.04
8	.46	.62	.79	.94	1.01
14	.46	.62	.79	.94	1.01
22	.49	.61	.82	.95	1.03
28	.45	.61	.77	.90	1.06
35	.46	.68	.87	.99	1.08
42	.48	.67	.80	.96	1.08
49	.47	.65	.85	.98	1.08

A series of tests were made to find the effect of aeration upon the rate of development with the regular borax developer. The results are shown in Table V in terms of the gamma values for the various times of development.

Table V. Effect of Aeration on the Rate of Development

	12 min. gamma	15 min. gamma	18 min. gamma	21 min. gamma
Regular borax	0.72	0.80	0.92	0.97
Aerated for 5 hours	.81	.93	1.04	1.09
Bubbled with carbon dioxide for 4 hours	.15	.36	.47	.52

(B) With Use

(1) *The Chemistry of Development.*—(a) During development a very complex chemical reaction takes place between the silver halide in the emulsion and the developer. I[illegible] case of a negative emulsion the silver halide may be [illegible] to consist essentially of silver bromide which reacts [illegible] hydroquinone developer as follows:

Silver bromide + alkali + sodium sulfite + hydroquinone = Silver + sodium bromide + hydroquinone sulfonates.

Quinone is probably an important intermediate product but it reacts at once with the sulfite to give hydroquinone monosulfonate.[13] This is a developing agent and may go through the cycle again to give hydroquinone disulfonate as a final product. Elon probably gives similar reaction products because the aminophenols, of which Elon is a member, are very easily oxidized to quinone.

The by-products of development, sodium bromide, sodium iodide, and the disulfonates of hydroquinone which accumulate in the used developer have a retarding action on development. As development progresses, the supply of developing agents is therefore slowly used up and the products of development accumulate so that a point is finally reached where there is a serious drop in the rate of development and the speed of the emulsion. The quantity of film that can be processed before this occurs determines the life of the developer.

A partially exhausted developer, however, can be rejuvenated by the addition of a fresh supply of developing agents so that it can go through another period of usefulness before it becomes exhausted.

(b) Sodium sulfite is used in most developers to protect the developing agents from aerial oxidation. When the developer is exposed to the air, a small quantity of the sulfite is converted to sulfate which in this concentration has no effect upon the development process. Some sulfite is also used up in forming the hydroquinone sulfonates, but the quantity involved is relatively small so that the effective concentration of sulfite in the borax developer remains practically constant with use.

(c) Sodium sulfite is also a solvent for the silver bromide in the emulsion and forms a silver bromide-sodium sulfite complex salt which is soluble in developing solutions. This solvent action goes on as a side reaction during development and the silver complex is then slowly reduced or developed to metallic silver which settles out on the walls of the developing tank and precipitates in the developer as a gray sludge. This sludge formation is a secondary reaction which both depletes the supply of developing agents and adds more restraining products to the developer.

(2) *Effect of Use on the Rate of Development.*—The experimental developers were exhausted in a miniature system with racks holding 50 inches of motion picture film, and tanks holding one-half gallon of developer. The data on exhaustion and revival, however, which are given below were obtained with the developer under commercial working conditions in a 120-gallon tank. The life history of several of these developers was followed by H. & D. methods with special emphasis placed on the changes that occurred when the developer was revived. Fig. 6 shows H. & D. curves obtained by developing for fifteen minutes at various stages throughout the life of a 120-gallon tank of borax developer.

An exhaustion curve for another batch of developer is given in Fig. 7. The gamma values and relative speed values are plotted against the quantity of film processed per gallon.

During use, the supply of developing agents in the borax developer is gradually depleted as a result of the development process itself and the process of sludge formation so that obviously the rate of development decreases with use. Referring to Fig. 6, for a given exposure when developing for 15 minutes, the density dropped from 1.90 to 1.64 after processing 80 feet of film per gallon. It was then necessary to increase the development time to 18 minutes to produce the density of 1.90 produced originally in 15 minutes.

Within the useful life of the developer, the time of development required to produce a given degree of development increases from 25 per cent to 50 per cent.

The shape of the time-gamma curve is not changed by the use of the borax developer. A series of time-gamma curves corresponding to those in Fig. 2 was made with a developer in which 60 feet of film had been processed per gallon. The gamma values were lower because of the partial exhaustion of the developer, but the curves had the same shape as those obtained with a fresh developer.

(3) *Effect of Use on the Emulsion Speed.*—It is well known that the accumulation of alkaline bromides and iodides and developer oxidation products in a developer has the same effect as reducing the speed of the emulsion.[14] The extent to which an exhausted borax developer reduces emulsion speed was determined by plotting H. & D. curves throughout the useful life of the developer and with the spent developer after it was exhausted. The H. & D. curves obtained by developing for 15 minutes in fresh and exhausted developers are shown in Fig. 6. Curve A was made at the start and curve B after 80 feet of film had been processed per gallon. From curve B it is seen that the restraining products had the effect of removing or subtracting a constant density from both the highlights and shadows of the negative. Since the fog density, however, dropped from 0.22 to 0.14 there has been very little decrease in the effective emulsion speed (see also Fig. 7). The speed decreases to a value equal to about 60 or 70 per cent of initial value. Development beyond this point (80 feet per gallon) results in a much greater decrease in emulsion speed. Curve E indicates the condition of the developer after 200 feet of film had been processed per gallon, and shows that the film speed is only 30 per cent of its original value.

The accumulation of the alkali bromides is partially responsible for the drop in the film speed shown in curve E, but no satisfactory method is known for removing them from the developer.

Further tests were made to determine if any of the usual developer constituents could be added to bring back the speed of the emulsion to its original value in the fresh developer. Borax, Elon, hydroquinone, sodium hydroxide, sodium carbonate, and potassium carbonate were added to a developer in which 40 feet of motion picture film per gallon had been processed. Most of them gave no practical increase in film speed and some of them gave a decrease in speed. Four grams of borax per liter added to an exhausted developer increased the speed of the film by about 50 per cent. Further tests are in progress to determine if there is a practical method of increasing the life of the developer.

(4) *Effect of Use on the Fogging Properties.*—The table in Fig. 1 gives the fog values for the fresh borax developer over a wide range of degrees of development. With use, the amount of fog decreases for a constant degree of development on account of the accumulation of bromide ions liberated by the development process. A fog value of 0.20 for a given degree of development in a fresh developer drops to 0.12 by the time 80 feet of motion picture film have been processed per gallon.

The above values are given for fresh film. Under working conditions the fog depends upon a number of factors which include: (1) the age of the film; (2) the amount of light scatter during exposure in the camera; and (3) the amount of exposure which the film may receive during handling in the darkroom. The fog density obtained in actual practice includes that caused by the developer plus the fog accumulated in the process of handling.

(C) Revival of the Borax Developer

The equation representing the chemical reactions occurring during development shows that the developing agents, the alkali and sodium sulfite, are used up in the process of development, although

(*Continued on Page 46*)

A. B. C. of Sound

(*Continued from Page 7*)

sists of an evacuated bulb containing a filament, a grid and a plate. The filament, when heated, discharges electrons which are, as we know, infinitesimally small particles of negative electricity, the escape of which from the metal is made easier and more pronounced with the increase of temperature of the metal itself.

Under normal circumstances, after a certain number of electrons have left the filament this becomes positively charged and it acquires a tendency to draw the escaped electrons back again to it. However, if a plate is placed at close proximity to the filament and this plate is charged with positive electricity, with respect to the filament, by means of a battery, commonly called the B battery, a certain proportion of the electrons will be attracted to the positively charged plate and constitute a current of electricity between filament and plate. If the voltage of the B battery is increased, the flow of electrons may be so increased to the point where practically all of the electrons emitted by the filament will flow towards the plate.

On the other hand, if the current of the plate is maintained constant and the emission of electrons from the filament is increased through an increase in its temperature, the current of the plate will be increased to a certain point after which it remains practically constant, even though the temperature of the filament is still increased. This is due to the fact that the flow of the negative electrons through the tube acts as a charge of negative electricity which neutralizes the field produced by the positive plate.

This charge of negative electricity, if neutralized, will produce an increase in the plate current. On the other hand, if the charge is increased by any suitable means the current of the plate will, of necessity, decrease.

These effects are brought about by placing a grid between the plate and the filament. The grid may be either a fine wire mesh or a thin perforated metal leaf and the electrons emitted by the heated filament have to pass through the small orifices of the grid to reach the plate. When the filament is electrically charged it will have a stronger effect upon the electrons emitted by the filament than the plate because of its greater proximity to the filament itself.

All the electrons which pass through the meshes of the grid are carried to the plate, but their number depends upon the charge of the grid and upon that of the plate. In other words, it depends upon their voltage. It is obvious that only a small change in the voltage of the grid will have as great an effect on the flow of electrons than a much greater change in the voltage of the plate.

The ratio of the change of plate voltage corresponding to a change of 1 volt in the grid is called "The Amplification Factor of the Tube". If the change of plate voltage is applied to the grid of a second similar electron tube, the process is repeated and can be continued until the desired total voltage amplification is obtained.

Now when an electric current is produced by a microphone and through the action of the sound waves striking its diaphragm, its strength is necessarily very limited, but if this current is submitted to the action of an electron tube, it will be sufficiently amplified that it can be carried at a distance to a system of other amplifying tubes, which will increase its strength sufficiently to actuate the light valves of the recording apparatuses, or the wax recording stylus.

Upon the above principles are based the sound *recording* systems used today in America, and which are divided in two very distinct classes. The recording on a wax disc and the recording on film sensitive to light.

Of the latter system we may mention the two classes, the "Variable Area" and the "Variable Density". In the first the amplified, modulated current of the microphone sets in vibration a mirror in accordance with the modulation of the current. A constant source of light is reflected by this mirror upon a slit conveniently placed and the image of which is brought to a focus upon the film. The vibration of the mirror varies the area of illumination of the slit and, therefore, the area of illumination affecting the film.

In the variable density system the modulated current from the microphone either varies the intensity of illumination of a glow lamp or varies the distance between two metallic ribbons which

(*Continued on Page 46*)

"Klieglights" for Talkies

Company Whose Name Is As Widely Known As Movies, Offers Brilliant Array of Lights For Sound Work.

THE advent of "talking movies" with its sensitive sound-recording instruments, imposing a restriction for absolute silence in the studio; and the demand for greater economy in the lighting of studio sets—has resulted in the development of a new form of Kleiglights for motion picture photography, in which high-candle-power incandescent lamps are used for the light source. These new Kleigs furnish brilliant, evenly diffused light high in actinic qualities, permitting photography with clearness of detail, full color values, sharp definition, and freedom from sound interference. They are absolutely noiseless in operation and cause no disturbance in the recording of sound photography. They are efficient in light control and utilization; afford complete command over the direction, diffusion, and divergence of the light beam; are light in weight; can be easily and quickly handled; operate on the service line, whether A.C. or D.C.; and introduce economies in current consumption, production time, and labor requirements. They are modern in every respect, adapted to present-day studio conditions, and furnish the kind and quality of light required in this new era of motion picture photography.

KLIEG-SUN (No. 1144B) is a long beam, high intensity floodlight for projecting a strong, well-defined, evenly-diffused beam of light a considerable distance—covering a restricted area; used especially for general lighting of deep sets, producing sunlight effects, spotting-out, modelling, and for accentuating main points of interest; accommodates 2000-, 5000-, and 10,000-watt G type Mazda lamps. Projector consists of a cylindrical lamp housing containing a receptacle, reflecting mirror and adjustable lens; mounted on a telescopic standard; set on a base fitted with ball-bearing rubber-tired casters; constructed as to minimize weight; designed to allow free and easy movements, adjustments in height, and to roll easily over the floor. It is well ventilated to insure comparatively cool operation—thus prolonging the life of the lamps; and slide grooves on the front permit the use of a diffusing screen.

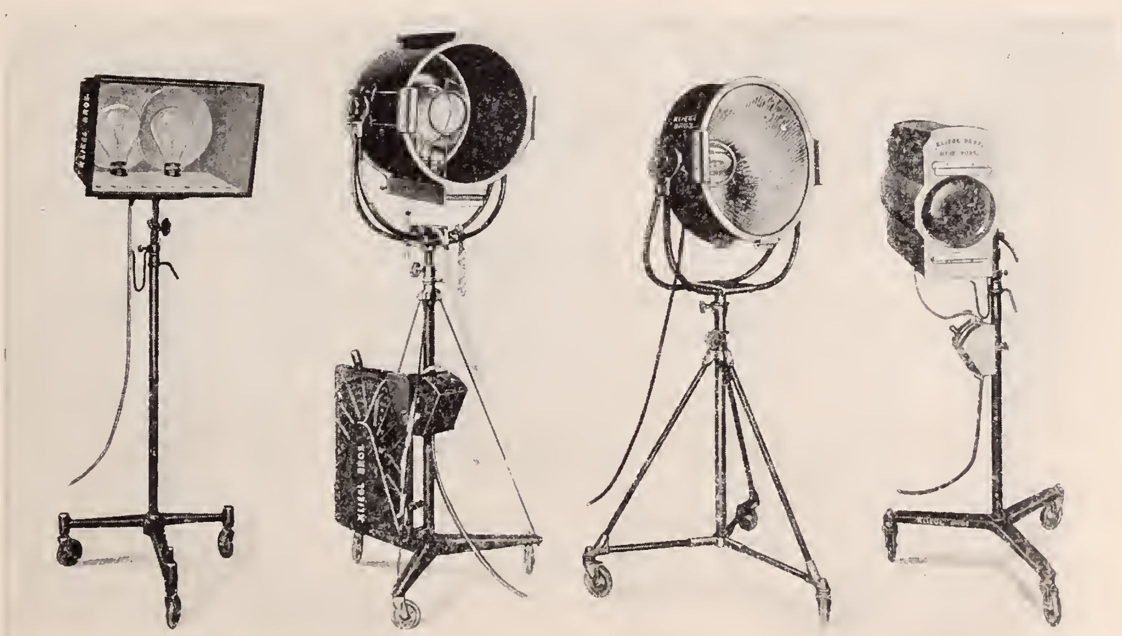
Receptacle for the lamp is mounted on a traveling base, controlled by a small lever at the rear of the housing. It moves along the reflector axis, which allows focusing the lens and regulating its beam spread from eight to approximately thirty degrees.

An adapter is furnished to fit the lamp receptacle, permitting the use of the smaller-sized lamps than that for which the unit is designed. The adapter serves to correctly position the lamp filament in the optical axis of the reflector.

A heat-resisting, mirrored-glass parabolic reflector, in the rear of the housing, back of the lamp, reflects the light, increases the efficiency, and facilitates control of the light beam.

A six-inch plano-convex condensing lens is set in front of the bulb—mounted on a movable carriage, controlled by a small lever at the rear of the housing, equalizes the intensity of the luminous rays and eliminates "ghosts" or dark center, which would otherwise be present when the beam is spread.

Mounting is so devised that the lamp can be balanced in any position; light beam projected in any direction; lamp raised or lowered within a (Continued on Page 37)



No. 1150 No. 1144-B No. 1153 No. 8N22

New Incandescent Klieglights for Motion Picture Photography.

Survey of Theatre Screen and Projection Machine Aperture Proportions Planned

AN IMMEDIATE nation-wide survey of motion picture theatre screen and projection machine aperture proportions will be conducted under the auspices of the Academy of Motion Picture Arts and Sciences in cooperation with other motion picture technical organizations.

Representatives of the Society of Motion Picture Engineers, The American Society of Cinematographers and the American Projejction Society met with the executive committee of the Academy Technicians' Branch Wednesday, July 17, in the Academy rooms. It was decided to hold the first of a series of joint meetings of the four organizations August 15 for action on problems affecting both the production studios and the theatres in connection with talking pictures.

Steps toward securing a standard screen proportion for theatres equipped to use both disc and sound on film methods will be taken on the basis of the national survey. Other problems which will be attacked by the studio and theatre technicians jointly include volume control in the theatre and changeover.

John F. Seitz, president of The American Society of Cinematographers and member of the Academy, was named for chairman of the first joint meeting. The committee in charge of the program is as follows: C. E. Dunning, president of the Hollywood branch of the Society of Motion Picture Engineers; Albert Feinstein, board member of the Hollywood chapter, American Projection Society; John Arnold of The American Society of Cinematographers; H. Keith Weeks, executive manager of Fox Movietone, representing the Academy, and Frank Woods, secretary of the Academy.

"Theatres equipped for both disc and film sound projection are confronted with a problem on the shape of their screen," Mr. Woods points out. "The sound track makes the frame more nearly square. When the aperture in the projection machine is adjusted to this the picture does not occupy all of the space on the oblong screen. Smaller theatres many times ignore all readjustment and the picture appears on the screen with a blank space down the side. If a drape is hung over one side of the screen it has to be taken away when a silent or sound on disc picture is run. A practice has grown up for the projecitonist in some theatres to mask off enough of the top and bottom of the aperture to make it the usual oblong proportion. Then he enlarges the picture to fill the whole screen by putting on a different lens. Not preparing for these conditions some studios make closeups and plan their composition in general to fill the whole frame. The result is that in many theatres the top of a character's head or his feet may be cut off in the picture as it shows on the screen.

Wm. Horsley Laboratories Handling Big Volume

With equipment installed that enables the handling of 2,700 feet of negative per hour and 11,000 feet of positive film per hour and with equipment to care for sound film in 1000-foot rolls, the William Horsley Laboratories, 6060 Sunset Boulevard, Hollywood, claims the honor of being the biggest independent film laboratory on the West Coast, and announces they are prepared to take an unlimited amount of independent business.

William Horsley, head of the laboratories, declares that he expects to secure the bulk of the "Independent" business during the coming year, as there is no other independent laboratory that can take care of the immense volume of work Horsley can handle.

Horsley also is prepared to treat film with his special "filmcote" process which he claims protects the emulsion side of the film from abrasions and scratches, seals moisture within the film, eliminates necessity of waxing, adds strength, makes possible the cleaning of oil spots and dirt from emulsion and affords great protection to the sound track.

Few persons realize that the Horsley Laboratories is one of the biggest 16 m. m. laboratories in the country. Last year a total of more than 5,000,000 feet of 16 m. m. film was handled in these laboratories. This business came from all sections of the United States. The laboratory makes a specialty of reduction printing, and many firms putting out 16 m. m. releases made from standard films have their work done by Horsley. The coming year, Horsley expects will be the biggest year in his history, and he confidentally looks forward to securing most of the independent commercial business now that he is prepared to take on unlimited footage of sound work.

Cinema Equipment Co. Announces New Silent Movement for Mitchell Camera.

The slogan of Cinema Equipment Co. is "Watch For New Fearless Products". Due to the activities of moving and getting settled in their new quarters at 7160 Santa Monica Blvd., they failed to announce a new product for the month of June.

However, during July, Ralph G. Fear, head of the organization, announced the new Fearless Silent Movement for Mitchell Cameras. Another announcement is that of silencing Mitchell cameras, adapting them for sound work outside of a booth.

These new products swell the total of special camera devices to the number of fourteen—-and new ones being announced each month.

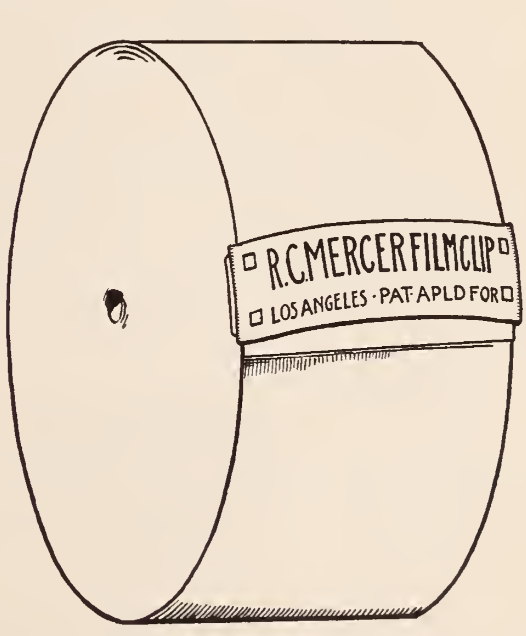
Among the Fearless products are the Simplex Movement for Bell & Howell and Mitchell; Camera Trip for Bell & Howell and Mitchell; Standard Clutch for Bell & Howell; R. C. A. Clutch for Mitchell; Motor Adapter, which adapts Standard Clutch to any Mitchell; Re-building and silencing of Bell & Howell and Mitchell cameras, which adapts them to any ordinary sound production outside of a booth—and many others.

One of the many Fearless devices is the camera Trip for either Bell & Howell or Mitchell. This Trip, when used in conjunction with the Fearless Automatic Clutch, will stop the camera instantly in the event of a film buckle. This de-clutching and stopping of camera is accomplished in the space of a half dozen frames.

Gordon Pollock, speaking of the Fearless Trip and Clutch recently installed on his camera says, "I feel that your Trip and Clutch are as necessary as camera insurance. Their cost is saved many times over in the event of a film buckle. They also prevent an enormous wastage of film by enabling the cameraman to disengage his camera instantly at the end of each take."

An entire building has been taken over by the Cinema Equipment Co. at 7160 Santa Monica Blvd. and equipped with precision machinery installed in a structure comprising some 7,000 square feet of floor space. Besides the factory proper, there is a drafting room, stock room, store rooms, and several offices.

With the increased facilities, the company announces it is now in a position to catch up with back orders and to meet the increasing demand for its products, which in its older quarters it was unable to do.



One of the most useful bits of equipment that has been devised for the handlers of film in many months is a film clip, shown above. This clip takes the place of the old rubber band which was used to hold rolls of film intact in the cutting room. This new clip, invented by R. C. Mercer, of 4241½ Normal Avenue, Los Angeles, is slipped on the roll and holds it firmly. The film cannot be scratched by the clip as it is raised slightly. For laboratory and cutting room, and for Amateurs, this clip should be a boon.

PHOTOGRAPHIC ASTRONOMY

An Unusual Paper On An Interesting Topic—Presented at the Spring Meeting of the S. M. P. E., New York City, May 6-9, 1929

By LESLIE E. CUFFE

IN PRESENTING this paper I wish you all to thoroughly understand that I am not an Astronomer, in fact I have never given it much thought until a Mr. Charles F. McManus came to me with several pages of data he had secured and worked into a very technical way dealing with Astronomy and asked me to read it over and let him know if there was any possible picture material in it. I searted to read but before very long I found myself millionsof miles away from this little earth of ours and very little chance of getting closer as I read further.

Leslie E. Cuffe

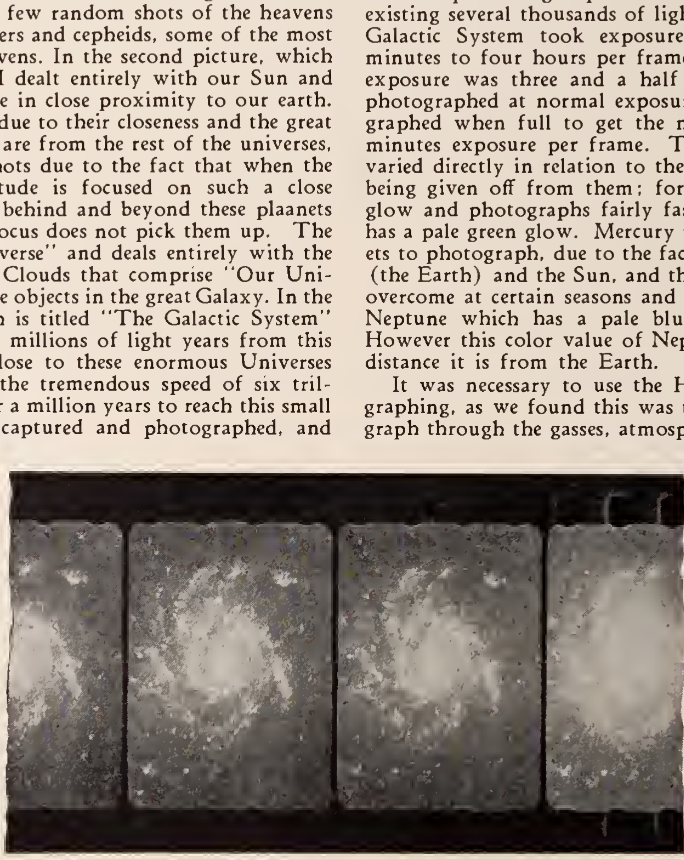
This struck me as being a great thing. Imagine in a few feet of film being able to take an audience out into space through great planets, star clouds, great gaseous regions, and into universes so great that this little earth and Sun and a few planets we see and feel about us become insignificant as compared to these enormous universes. With this thought in view I took all this material and grouped into it what I thought would make four very interesting pictures, building around each group sufficient story and travel to make them also interesting to the untechnical mind.

The first picture I titled "Mt. Wilson" and dealt more or less with the different telescopes, their differences in magnification as compared on a given star and a few random shots of the heavens showing the great globular clusters and cepheids, some of the most remote objects of the entire heavens. In the second picture, which is titled "Our Solar System," I dealt entirely with our Sun and its eight planets all of which are in close proximity to our earth. However, these planets of ours, due to their closeness and the great distance we (our Solar system) are from the rest of the universes, do not make very spectacular shots due to the fact that when the telescope of such great magnitude is focused on such a close object to objects in the regions behind and beyond these plaanets are so remote that the plain of focus does not pick them up. The third picture I titled "Our Universe" and deals entirely with the closer nebulous clusters of Star Clouds that comprise "Our Universe" and are not as remote as the objects in the great Galaxy. In the fourth and last grouping which is titled "The Galactic System" we take you out into Universes millions of light years from this earth of ours and bring you close to these enormous Universes whose light alone traveling at the tremendous speed of six trillion miles per year has taken over a million years to reach this small earth of ours. This we have captured and photographed, and brought to the screen one of the most increditable sights the human eye has ever or probably ever will witness. I am now going to try and explain some of the difficulties we encountered and overcame in the making of these pictures.

There are many obstacles which present themselves that heretofore have not been encountered in the photographing of motion pictures. For example, when our camera was placed in the telescope and the telescope focused on a given object we immediately encountered on time exposure eight motions that had to be corrected; for, in the relation of our camera and the object being photographed, that is, the earth is constantly revolving on its axis and traveling along its orbit, while its poles are constantly tipping and revolving in the fashion of a top that is losing its speed and starting to slow down. At the same time the Sun is traveling through its orbit, and the object we are photographing is revolving and going through space on its orbit. Therefore, when all these motions are taken into consideration there is a constant changing and displacement of this earth in relation to any object in the Heavens which we may be photographing. To offset all these motions that are encountered in relation to this earth and the various objects in the heavens, these enormous telescopes are all controlled electrically and by clockwork so that over any given period of time the same position can be maintained of any object in the heavens after the telescope is once set by the professor who calculates it mathematically.

The next difficulty we ran into was the exposure necessary for the different planets. Nebulae, Star Clouds, and Universes we had to photograph. Each object had to be tested individually before actual shooting of the camera to determine the time exposure necessary per fram of motion picture film. This alone took considerable time when we take into consideration that our photographing time exposure per frame on the Nebulous Clusters, Illuminous Gasses, Dependant and independant groups of Suns and their surrounding worlds existing several thousands of light years in the central part of the Galactic System took exposures from three hours and fifteen minutes to four hours per frame. Or, we might say the average exposure was three and a half hours per frame. The Sun we photographed at normal exposure. The moon which we photographed when full to get the maximum light volume took 17 minutes exposure per frame. The planets surrounding our Sun varied directly in relation to their distance and the color of light being given off from them; for instance, Mars which has a red glow and photographs fairly fast as compared to Uranus which has a pale green glow. Mercury is one of the hardest of our planets to photograph, due to the fact that it lies in a path between us (the Earth) and the Sun, and the light from the Sun can only be overcome at certain seasons and times. The other planets, except Neptune which has a pale blue glow, photograph fairly fast. However this color value of Neptune is offset by the tremendous distance it is from the Earth.

It was necessary to use the Hydrogen filter in all our photographing, as we found this was the only filter that would photograph through the gasses, atmosphere and water vapor which surrounded a lot of the objects we were photographing.



View of a spiral nebula throwing off material which condenses to form new worlds

Our process of photographing the heavens which we have recorded and incidentally are the only authentic records on motion picture film of these different bodies, took over a period of fourteen months, working every night through the different telescopes on Mt. Wilson, California, and was made possible only by the fine cooperation that was given us by the Carnegie Institute of Washington, D. C., and the untiring efforts of Dr. Adams, Professor Joy, and Professor Ellerman, of the Mt. Wilson Observatory staff.

Planetary Wonders Viewed Through the Camera

Upper left is a globular cluster which is part of the Milky Way, a stellar Universe within itself, 30 million times larger than our Sun. Upper right is a cluster of variable Cepheids. Center is Cyganus Constellation, a filamentary Nebula about 600 light years from the Earth. Lower left is Orion, known as "Celestial Sea Horse," never seen by the naked eye. Lower right is Canes Venatici, it is throwing off material for new worlds.

By WM. STULL, A. S. C.

Amateurs and Novices

IN ALMOST all sports there are recognized three great classes: novices, amateurs, and professionals. No one would dream of classing Joe Smith, who just 'took up golf' last month, with Bobby Jones; or Susie Blake, the tennis novice, with Helen Wills—yet when it comes to photography in any form the world does that very thing, without thought of its inconsistency. One is either an amateur—a blundering novice, or a professional—and perfect.

This is very flattering to the professional, but gravely unjust to the advanced amateurs who have by patient study so perfected their art that they could take place beside the greatest of professionals, if they chose, but prefer to follow their art merely for the love of it rather than for profit. They are the true amateurs, distinct alike from professional and novice, and worthy of being recognized as such.

If there is any one term more applicable than others to describe the photographic novitiate, that term is "snapshotters," for it sums up in a word all that they have yet learned about photography. They are the ones who have not yet passed the "you-press-the-button-we-do-the-rest" stage—the ones who have not yet become conscious of the vast, unexplored world of new experiences awaiting them in the realm of true amateurism.

Probably the first thing that indicates the beginning of the evolution from snapshotter to amateur is the growing attention to little details of technique; the birth of a spirit of inquiry; the conscious expenditure of thought on the business of taking pictures—the change from a picture-*taker* to a picture-*maker*. And as this expenditure of thought increases, so also the individual's artistic stature increases. As the individual grows artistically, technique grows to mean more and more to him. It is no longer a set of dull rules and observances to hinder him, but a living, vibrant aid in perfect artistic expression. Little things, once hurriedly passed over—correct exposure, considered composition, better-chosen subjects, interesting action, novel angles—a myriad of small technical precautions that once seemed foolish and useless, now become vitally important tools for the maker of pictures, whether they be still or moving.

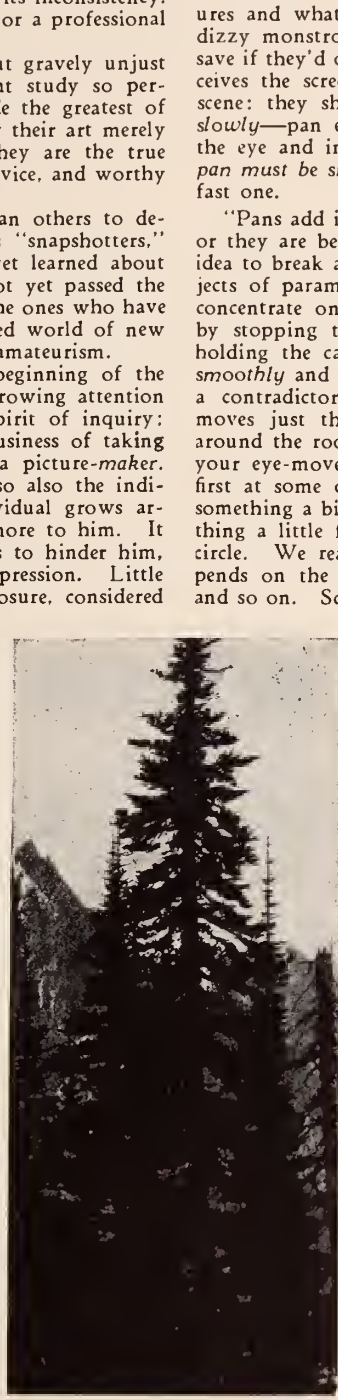
Use A Tripod

If genius consists in a capacity for taking pains, surely, too, success in art or science lies in a willingness to remember details. For instance, there is the tripod. To the novice, who still remembers that he paid for a *hand*-camera, a tripod seems merely a useless bother and expense, but to the advancing amateur it means security—a necessity, not an accessory. Not even the best of cinemachinery can give a steady picture from an unsteady support—and not even the best of humans can rival the physical firmness of a $5 tripod. Serious amateur still-photographers long ago learned that though hand-cameras work well when hand-held, they work better and surer from the firm support of a tripod. Most of them would as soon leave filters or film behind as forget their tripod. Press photographers, whose livelihood depends on the constant delivery of unfailing results, almost always pack a tripod along with their ubiquitous Graphics and Deckrullos. They have to travel light—but not so light as to dispense with a tripod! Why, then, should the cine amateur, equally desirous of sure, vibration-free results, feel himself above using a tripod?

Proper Panning

This question of tripods brings to mind also the question of proper panning. Recently the head of one of Los Angeles' largest cine departments said to me, "The worst fault of 90% of the work that goes through our plant is bad panning. Most amateurs use their cameras as if they were machine guns—jerk them around hither and yon as though they were spraying a rival gang with bullets. You can imagine the result on the screen, can't you? A meaningless, blurry jumble of scene, figures and what not—at best, hard on the eyes, and at worst a dizzy monstrosity. How much trouble, regret, and film they'd save if they'd only stop and think before shooting! The eye perceives the screened image vastly slower than it does the actual scene: they should keep this in mind, and allow for it—pan *slowly*—pan even *slower* than what they *feel* is *too slow*, for the eye and imagination conspire to trick the mind. *And the pan must be smooth!* A jerky pan is almost as bad as an over-fast one.

"Pans add interest to a scene, but they must be carefully done, or they are better not attempted. For practical use, it's a good idea to break a pan up a bit: usually there are two or three objects of paramount importance in any scene calling for a pan; concentrate on them—deliberately focus the attention on them by stopping the panning movement when the first is central, holding the camera fixed on it for several feet, then move on *smoothly* and *slowly* to the next, and so on." This sounds like a contradictory statement, but it isn't. The eye ordinarily moves just that way. Look up from this page, and glance around the room. If you consciously *see* anything, and analyze your eye-movements in so doing, you will find that you look first at some object, say on your left, then move smoothly to something a bit on the right, stop, perceive it, move on to something a little further on, and so on until you've completed the circle. We read the same way: a few words, (how many depends on the individual angle of vision), then the next few, and so on. Scientists say that this is because the eye is practically blind while in motion: it must stop and focus on some definite object before it can transmit a clear picture to the brain. The camera is much the same, but it records slow, smooth pans better than the eye does. Thus a slow, smooth pan is cinematically satisfactory, but as the final appeal is to the human eye, it is better to pan as the eye does. This general principle is borne out in studio practice, for important action almost never occurs during a camera-movement except when the movement is such that the characters are kept in practically unchanged relation to the lens, as in follow-shots. This, by the way, gives a hint as to why the rapid pans of the Akeley camera are not disagreeable: the pan is held absolutely steady by the gyro apparatus, and, in addition, the subject being followed appears practically fixed against the rapidly-moving, indistinct background.



About Reflectors

While on the subject of professional practice, a word about reflectors isn't out of place. Anyone who has ever seen a professional company shooting exteriors remembers the abundance of reflectors used. They are as vital to out-of-door cinematography as rudder and ailerons to an airplane, for they are the means by which the cinematographer controls the sunlight to paint the picture as he wishes it. They can be no less useful to amateurs—especially to Kodacolor users, to whom strong, even lighting is so important. Yet even

(*Continued on Page 43*)

Kodacolor Processing Stations

FOR the benefit of our readers who may be travelling abroad and for our many subscribers in foreign countries, we print herewith a complete list of stations in foreign countries where Kodacolor film may be processed. The Eastman Company announces that additional foreign stations are being installed as rapidly as possible. Those already equipped follow:

London: Kodak, Ltd., Kingsway, W. C. 2.
Paris: Kodak Pathe, Place Vendome, 28.
Berlin: Kodak Aktiengesellschaft, Leipzigerstrasse 114.
Batavia, Java, Kodak, Ltd., 8 Noordwijk 38, Waltevreden.
Singapore: Kodak, Ltd., 8 Battery Road.
Melbourne: Kodak Australasia Pty., Ltd., 284 Collins St.
Calcutta: Kodak, Ltd., 17 Park St.
Cape Town: Kodak (S. A.) Ltd., 38 Adderley St.
Honolulu: Kodak Hawaii, Ltd., 817 Alakea St.
Havana: Kodak Cubana, Ltd., Zenea 236.
Panama City: Kodak Panama, Ltd., Edificio Grebmar, Avenue Pablo Arosemena.
Lima: Kodak Peruana, Ltd., Divorciadas 650.

In the United States and Canada, Kodacolor film is being processed at:

Rochester: Eastman Kodak Company.
Chicago: Eastman Kodak Company, 1727 Indiana Ave.
San Francisco: Cine-Kodak Service, Inc., 318 West 8th St.
Toronto: Canadian Kodak Co., Ltd., 66 King St. West.

It is advisable to have your Kodacolor film processed as soon as possible after exposure, so the foreign list printed above will, we hope, prove of benefit.

Watch Your Fingers

WHEN making an exposure always be careful not to allow the fingers or any other solid object to come before the lens of your camera. Under ordinary conditions this probably will not occur, but under stress of excitement where quick action is called for, be careful. The finder will not warn you, and you may discover later that a choice scene has been spoiled. Making movies is like hunting—calmness at all times is necessary for success.

INFORMATION FOR AMATEURS

Amateurs—Send your problems to this department and have them solved by the world's finest cinematographers—the members of the A. S. C. This is your department. Our aim is SERVICE. Write us and find your answers here.

Question from L. R., St. Louis: In your July isues you answered a question regarding gauze-mattes. Is there any definite distance from the lens at which such mattes or vignettes should be placed?

Ans.: No. The distance can be altered to fit the subject and effect desired, but it should be remembered that the closer to the lens the gauze or mask is, the more diffuse the effect, and the more diffuse the outline of the iris or other vignette. Conversely, the farther from the lens, the sharper the outline.

Question from H. H., Cleveland: Is there any danger of fires with large quantities of 16mm. film if stored in the home?

Ans: No. While the 'safety-stock' upon which all 16mm. film is coated is of course slightly combustible, it is no more so than the paper upon which ordinary kodak prints are made. Thus if it is kept—as it should be for best preservation—in metal cans, particularly the metal humidor-cans now available, there is no danger. The best proof of that is that all the insurance companies recognize the safety of such film, and approve of it. It is not coated on the highly inflammable stock that X-ray films are on, so there is no danger of domestic repetitions of the recent hospital tragedies caused by the explosions of X-ray films.

Question from H. G., Los Angeles: What is the best position for a color-filter?

Ans.: Theoretically, it should be as near as possible to the focal-plane (i. e. the film or plate). Generally, this is best done by putting it behind the lens; but often—especially in 16mm. cinema cameras—this is not possible. Hence the filter should be mounted in front of the lens, as close to the lens as possible, and always protected from the direct rays of the sun. In Kodacolor work, the compensating filter should be kept as close to the lens as possible or the results will be very inferior.

Question from L. D., San Diego: When in doubt as to the correct exposure for a given subject, should I over- or underexpose?

Ans.: When using negative film, and having a print made from that—as in ordinary still photography, or in using 35mm. apparatus—the old rule holds good: "expose for the shadows, and the high-lights will take care of themselves", and if in doubt, overexpose a bit. But when using the standard 16mm. *reversal* film, the reverse holds true: underexpose a little, for that gives a better result on the screen with this kind of film.

Question from M. S., Chicago: When should a neutral density filter be used in making Kodacolor pictures?

Ans.: The neutral density filter should be used where the light is exceptionally bright, such as distant sea or sky scenes, all beach scenes and distant landscapes and mountains. Full-length or half-length portraits, if the subject is dressed in white or light colored costume also require this filter. On another page is a reprint of some important suggestions relative to using Kodacolor, reprinted from the "Cine-Kodak News". Read it carefully and you should profit by it.

Question from S. K., Brooklyn: This gentleman wishes advice as to how to "break into" the professional cinematographic field. He explains that he has taken a course at an excellent school of photography, that he has mastered the projectionist's art and has done considerable news reel work.

Ans.: Because of the large number of letters received by the editor asking this same advice I will answer in a general way here, and will write you personally in greater detail shortly.

In the first place, it is a difficult task to become a cinematographer in the great field of motion picture making, and unless a man is willing to wait a long time and struggle along at perhaps very menial tasks, he had better decide on some other profession. The field is pretty well filled and you will find many men ahead of you with a lot of real experience waiting their turn. It is almost next to impossible for a beginner, unless he knows someone in authority, to get a start on a camera unit. My suggestion is to try to get into a laboratory at a studio, and after working there for some time, always with eyes open to opportunity, then make your bid for a place as an assistant and if you get it, work hard and be patient. It requires years, most of the time. However, you might find a way to "hook on" with a news-reel organization and from this get the chance eventually. But getting into a laboratory is the best advice I can give.

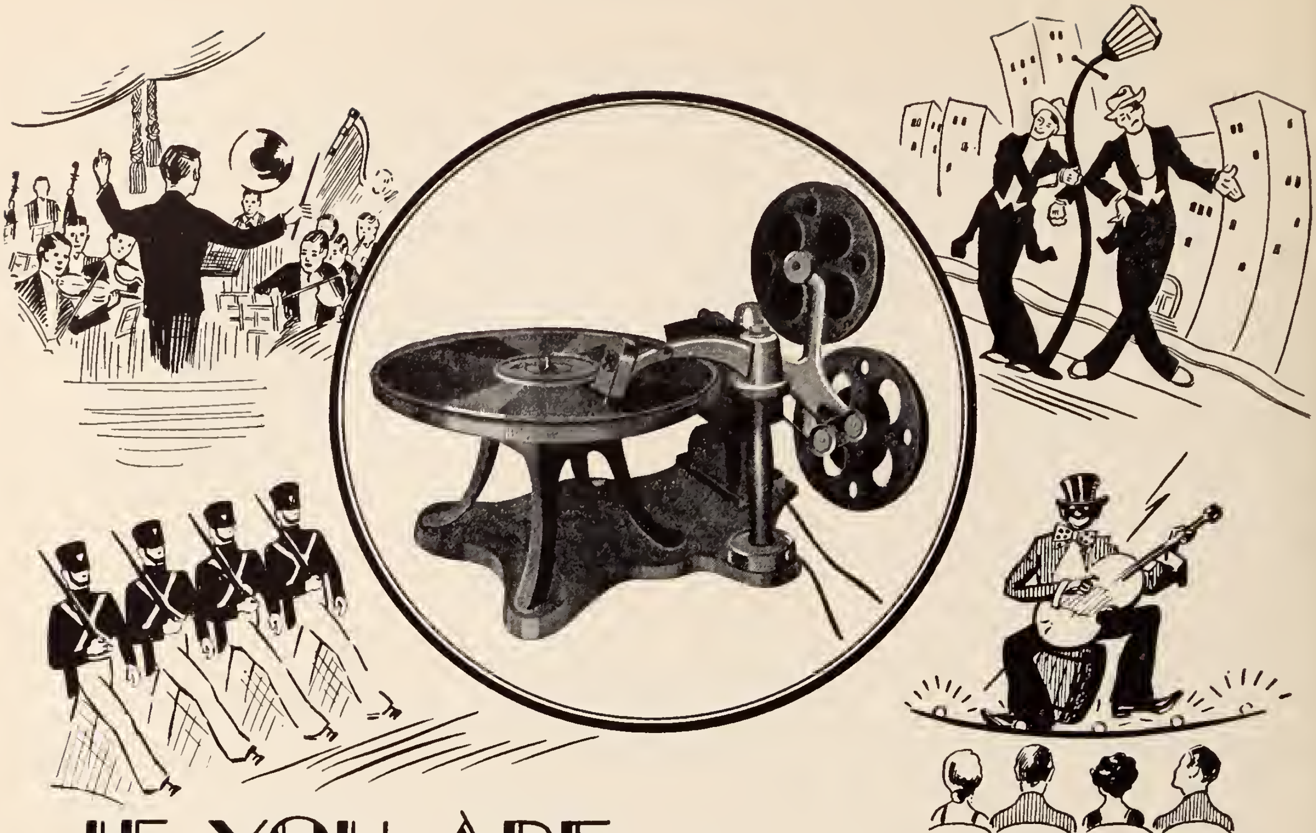
Ultra High Speed Studies Offered for Home Use

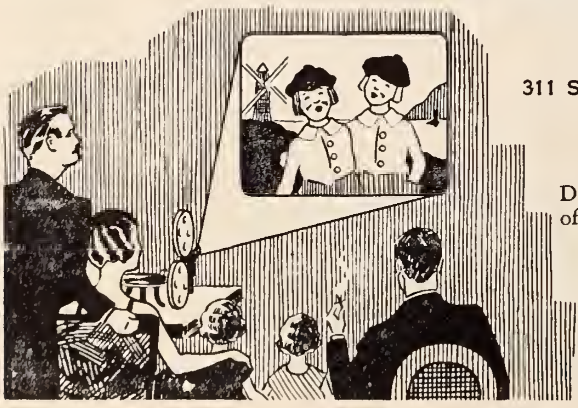
BURTON HOLMES Lectures, Inc., have brought out one of the most interesting series of high speed motion studies ever offered the 16 mm. enthusiasts. Three subjects comprise the list of releases, and they are a valuable addition to any 16 mm. library.

"Pigeons in Flight", a study of the flight of the pigeon, is a remarkable picture. It is claimed to be the first photograph showing human eyes how birds fly. It was taken at the enormous speed of 3200 pictures a second by Charles Francis Jenkins of Washington with his $10,000-camera, and the movement reduced two hundred times.

"Diving, High Jumping and Lariat Throwing" compose the second 100-foot reel.

"Hurdling and Baseball Pitching", make up the third. Each are 100 feet in length and may be obtained by writing Burton Holmes Lectures, Inc., 7510 No. Ashland Ave., Chicago.





THE CAMERA INTELLIGENT

A Few Pertinent Facts Concerning the Demands of the New Type of Amateur and What Bell & Howell Have Done To Fill Them.

By JOSEPH A. DUBRAY, *A. S. C.*

IT WASN'T so very long ago that motion pictures were confined entirely to the professional field. It was a new development—a discovery—something that intrigued the public, something that, as is the fate of all useful discoveries, was praised or denigrated, held as a promise or as a menace, according to the vision or perhaps the interests of individuals, as well as bodies of men, institutions, communities and even nations.

The relative exposure indicator, which, although it has no control over the camera mechanism, is attached to the Filmo 70-D camera for convenience in use.

But its place in our modern social system was soon affirmed, and since its appeal was irresistible, its commercialization rapidly evolved in the field which was to present the greatest opportunities of financial success.

The amusement field was the most logical, since it presented the opportunity of retail selling at a very low price with the greatest possible rapidity to the greatest number of people.

The assertion may appear very crude, almost rude, but this does not minimize its truthfulness and portent.

The nature of motion pictures, the very niche that they created for themselves in our general scheme of living, surrounded them with a glamour, a fascination, an atmosphere of romanticism, seldom equalled and never surpassed by any other industrial, commercial, or artistic achievements.

No wonder, then, that the general interest would be awakened to the possibilities of popularizing the making of motion pictures.

The possibility of keeping alive forever the family record, or souvenirs of travel, or other phases of one's life in more vivid manner than through the collection of a number of "still pictures," led the way to the formation of an army of amateur picture fans.

Two great obstacles were, however, blockinng the way—the cost of the necessary apparatus and materials and the intricacies inherent to their operation. Motion pictures making was considered as something somewhat beyond the reach of the ordinary man, something that may be of interest to one, but that could not be approached by ordinary means.

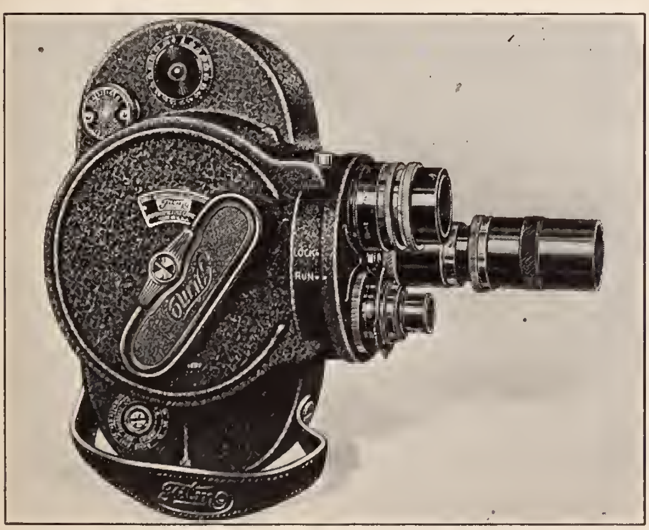
These obstacles were, nevertheless, brushed aside. Films were made and offered to the public at a reasonable cost, the technical difficulties of processing them were swept away by a master stroke, and men of vision designed and manufactured cameras and projectors which could be easily obtained and used.

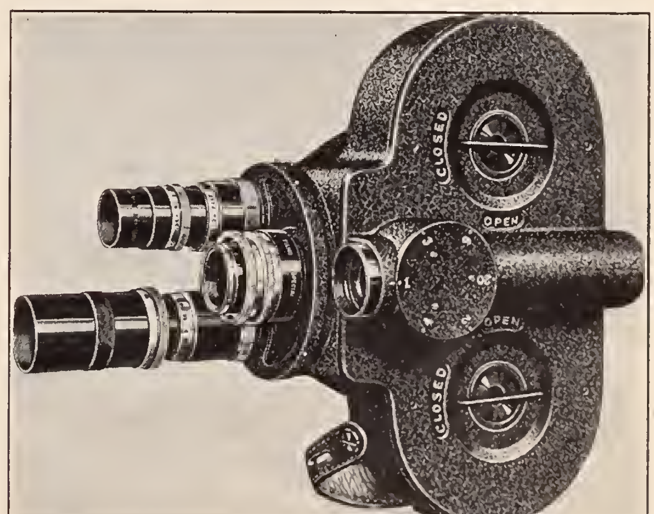
The response of the public was remarkable. Not only did motion pictures invade the home, but they also spurred the man of science and of industry to avail himself of the unlimited possibilities offered.

A new class of motion picture amateur was created almost over night. But can we really call amateurs the number of researchers who today have recourse to motion picture photography as an aid to their investigations? The doctor who records in motion pictures the action of living organisms or the performance of operations? The industrial who applies motion pictures to the precise recording of the functioning of the machines or products he manufactures, the educator who, more and more, realizes the great possibilities of motion pictures as a mighty collaborator?

This new class, which we may possibly call the semi-professional, welcomed the advent of the 16 mm. camera and projector with open arms and requested more and more insistently the creation of new apparatus more able to answer requirements, among which portability of the instrument, dependability, perfection of functioning, ease of operation are paramount.

It also become apparent from all quarters that it was not sufficient nor satisfactory to the amateur to make simple pictures and to rely solely on the interest they awaken just because they "move" on the screen. The amateur began to feel the urge of





At left: Filmo 70-D Camera equipped with 1" F 3.5 Universal Focus, 1" F 1.8 Focusing Mount, and 4" F 4.5 Focusing Mount Taylor Hobson Cooke Lenses. This view shows right side of camera, footage dial and speed adjustment dial above, and the relative exposure indicator below. The folding winding key, starting button and "lock" and "run" index marks also show. At right is a closeup of Filmo 70-D adjustable viewfinder, shown set to match the 1" lens.

adding beauty to the picture, to express his artistic sentiments in them, to rival the cinematographic results that he daily sees on the thousands of theatre screens all over the country—and the semi-professional began to want to take advantage of the truly marvelous technique developed by professionals throughout the world.

The Bell & Howell Company not only felt the pulse of public opinion, but anticipated its desires, and constantly and gradually increased the versatility of the equipment of its manufacture.

And now a new, great, almost revolutionary improvement!—The FILMO CAMERA MODEL D-70.

The features incorporated in this instrument, only two of which will be mentioned in this article, are the logical result of a patient and constant survey of the desiderata of the amateur cinematographer and will satisfy his most exacting needs under all conditions.

First, an improved, quick, and effortless change of lenses through an easily operated, newly designed turret head, which makes possible the choice between three lenses of different focal length combined with an extremely convenient and rapid setting of the finder to match the field of view of the lens. This feature will be especially welcomed by the sportsman, the traveler, the naturalist, and by all in all occasions in which a displacement of the camera is desired where time or space are in default.

The change from one lens to another is so controlled that the camera cannot be operated unless the lens is in its correct position. A truly worth-while detail, which will be appreciated when the switching of lenses is done under pressure of time and excitement.

Second, the variety of working speeds to which the camera can be instantaneously set. From a speed of eight pictures per second to the one of 64 pictures, *through the whole range of intermediate speeds*, which can be done so rapidly, so positively, that it is just "play" to change at a second's notice the natural movement of your subject to a faster tempo or to the slow motion which is so fascinating and enjoyable in the pictures that one takes for pleasure, and which is such an important factor in motion pictures of a scientific or documentary nature.

It would seem, at first thought, that a motion picture camera possessing such versatility should be an instrument difficult to manipulate and requiring expensive and bothersome up-keep. The truth is that the engineers of the Bell & Howell Company have succeeded in devising an instrument which does not require more care of handling than the FILMO of previous design, with perhaps the exception of necessitating more frequent lubrication, and even this operation is made extremely easy by the accessibility of the oil holes.

A great deal could be written about this truly marvelous instrument, but space is limited and we shall reserve the pleasure to return to the subject at another time. We said "pleasure" because it is a real pleasure to refer to a camera which we may call "intelligent" because of the impossibility in which we find ourselves to find a more adequate expression.

Summer Diaphragm Schedule

QUESTIONS regarding summer light and proper exposure have been pouring in, and the following diaphragm schedule is printed with the hope that it will solve the problems of many amateurs. The schedule is for August and September, for black and white pictures.

For sea, sky and beach scenes, or for mountains and distant landscapes, *f*.16 when the sun is shining brightly; if light clouds partially obscure the sun, *f*.11; if the day is dull and cloudy, *f*.8.

For open landscapes or action in areas where there is no heavy shade, *f*.11 in bright sunlight, *f*.8 if clouds partially obscure the sun, and *f*.5.6 or *f*.6.5 if the day is cloudy.

Where houses or trees obstruct part of the light from the sun, *f*.8 in bright sunlight, *f*.5.6 or *f*.6.5 if light clouds are present, and *f*.4 if the day is cloudy.

Scenes in deep shadow or along the shady sides of streets will best be made at *f*.5.6 in bright sunlight, *f*.4 when light clouds are present and *f*.3.5 if the day is cloudy and dull.

Scenes on heavily shaded streets or on porches can be made with the opening *f*.4 when the sun is shining brightly and *f*.3.5 when light clouds partially obscure the light from the sun. If the day is cloudy and dull, such scenes should not be attempted except with the *f*.1.9 lens, used at its widest aperture.

Talkies by Your Fireside

Bed-time Stories Now Pictures, and Grand-Dad and Grand-Ma Can Hear Their Talkies in Their Easy Chairs.

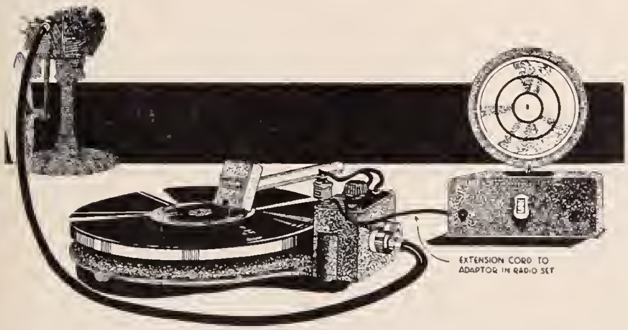
By M. L. Simmons

THIRTY years ago it was the penny circus in the barn; today it is the sound film in the parlor. The standards by which the showmanship ability of the younger generation was judged have not budged in these thirty years, but the means by which it is perpetuated has changed beyond recognition.

No more is it the bearded lady posed by Cousin Eleanor, or the fire-eater successfully essayed by Brother Bob, even if it was at the cost of a new suit of clothes. The line that attracts friends and neighbors now goes something like: "Come into my house of talkies."

More specifically, The Home-Talkie Machine Corporation, of 220 West 42nd Street, New York, has given the modern parlor exhibitor a new medium of showmanship in a device that will attach to any home film projector, and which, when plugged in on the radio set, amplifies wax disc records in perfect synchronism with the picture. Thus does the combination genii of radio and screen invade the home, bringing the thrill of the motion picture theatre to the hearthside.

In appearance the home-talkie unit, as it is called, resembles a miniature phonograph, being simple in construction, compact and portable. Perfect synchronism of sound and picture is assured at all times by the fact that but one motor drives both projector and talkie unit. A flexible shaft connects the turntable to the projector, and an adjustable driving mechanism governs speed of rotation, so that regular phonograph records may be run on it, thus eliminating the need of a phonograph. An electric pick-up is connected with the radio set through a volume control and extension cable. The regular radio loud speaker is used and is placed near the screen for best results in maintaining the illusion of the talking screen.



Above illustration shows the simplicity of Home Talkie device.

The device is not necessarily sold with a projector. For those who already own home projectors—and statistics give it that over 250,000 American homes have had them in operation the past year—the problem of acquiring a home-talkie unit, so far as expense is concerned, is no greater than that which confronts the radio fan planning to buy a new set of tubes.

An interesting feature of the device, in fact one that might be said to be the most important factor in making the showing of talkies in the home practical, is the "ripple killer." Ordinarily, the vibrations of the motor and fluctuations in the motor speed would communicate itself to the talkie unit, causing distortion and otherwise affecting the quality of the sound. The "ripple killer" is in this case a mechanical sedative and shock absorber combined, ironing out the effects of the motor oscillations.

Coincident with the launching of the home-talkie unit for practical home use, the Home-Talkie Machine Corporation has released sixteen film subjects produced by its own studio. Charles R. Rogers, well-known in film circles as co-producer of such outstanding screen attractions as "The Cohens and Kelleys," "McFadden's Flats," "The Gorilla," "Shepherd of the Hills," is head of the producing organization.

Featured in these sixteen subjects are Eddie Dowling, popular stage and screen star; Phil Baker, musical comedy comedian; Erno Rapee, composer, and conductor of the Roxy Symphony Orchestra; Miss Patricola, Radio-Keith-Orpheum star; Abel Baer, popular song composer; Fred Ketch, ventriloquist; Guignol Studio Marionettes, Peggy Hanlon, Evangeline Murray, and an eight-piece orchestra, to be known permanently as Home-Talkie Syncopaters. The marionette and ventriloquial subjects represent a new departure in the talkie field, entertainment of this character having never been attempted by theatrical producers.

The company's avowed policy is to comb the vaudeville, legitimate, radio, concert, operatic and motion picture fields for the best talent available, to produce such subjects as are best adapted for home-showings, with its own producing personnel and its own directors. This is in itself an innovation; for, in the past, such films as have been available for home showings were condensed extracted versions of old films that had outlived their usefulness in the theatre.

And so, summed up, the Home-Talkie Machine Corporation's activities are pioneer efforts in at least two instances: one, the launching of an inexpensive device that brings it within the reach of practically every person who owns a radio set; two, the producing of screen subjects, made essentially for home consumption. And, to harp back to the opening of this article, capping the evolution of home ownership, it takes little imagination to picture a sleepy child saying to a very relieved father: "Daddy, can I hear a bedtime picture?"

Below is a close view of the Home Talkie unit which may be attached to any 16mm. projector and played through the radio.

*A*t the *B*ottom of the *S*ea

Dan Clark, A. S. C., Takes a Look at Some Horses Hoofs From a Peculiar Spot—And Gets His Picture, Too

By LORETTA K. DEAN

This is the second of a series of stories of the adventures of A.S.C. members. Watch next month for another story of Cinematographic adventure.—Editor's Note.

A CAMERAMAN down beneath the waters of the Pacific ocean in a home-made diving bell . . . . a wooden contraption with a glass top . . . . just ordinary window glass cemented into place. Two horses suddenly gone made with excitement, threshing about in the water and with iron-shod hoofs kicking the thin glass covering of the bell a few inches from the cameraman's head. . . .

No, this is not a scene from a motion picture—it is just an experience in the life of Dan Clark, Fox cameraman, and former President of the American Society of Cinematographers.

Those individuals who think that there is nothing of adventure or interest in the lives of our cinematographers may well rub their eyes, for the cameramen rarely mention such occurrences; just take them as part of the job and forget them as they pass.

It was some years ago that Clark did his diving act. He was head cinematographer for the Tom Mix unit at Fox studios, and there was a sequence in which two horses and their riders were to be photographed out in the ocean. Someone thought it would be a good shot if a camera could be put under water and a closeup procured of the swimming horses from directly beneath them.

Clark, always fearless, agreed, and it was planned to make this shot. However, a diving bell could not be secured in time to do the work and production couldn't be held up—you know how picture companies are on those things.

So, Clark designed his own diving bell and built it.

"I had to do a fast job on the bell," said Clark, "and when I had it finished I didn't know whether it would hold the water out or not. I had nothing but ordinary window glass for the top, but figured it would work if the cement held.

"We took the bell over to Catalina Island with us and took it out on a lighter with the horses and made ready for the shot. I had no time to fix up much breathing apparatus, but figured that a tube running up to the surface would give me plenty of air. I had another rope going to the surface also. I was to jerk it three times as a signal to be pulled up. An assistant was to keep the rope in his hand all the time in case anything happened.

"Well, all was ready, and I climbed into the bell and the lid was shut down and I was lowered beneath the water. I had a funny feeling, I admit, as I started down. I couldn't help wondering about the cement holding that glass top. It was supposed to be waterproof, but you know how those things are.

"I was all set and gave the signal. Over went the horses. But we thought they would be rational horses. They were not. They were the flightiest horses I ever saw. They became frightened and started kicking around in the water as though they were in a swarm of bees. I started cranking and was getting some great stuff . . . But just then for some reason my diving bell came a little closer to the surface, and in a moment those horses hoofs were beating a tattoo on the top of that old diving bell.

"I pulled my rope for help, but no one answered and the kicking continued. I learned later that the fellow who was to pull me up, had got excited and had gone ashore. As nothing broke I shot a few more feet of the horses—and then they passed along and I was brought to the surface."

Dan Clark, A. S. C.

"How about the scene, was it successful?" we asked. "Oh, yes, great," replied Clark. "But I never used that bell again. I kept it in my back yard for a long time. It had the marks of the horses hoofs on it. Used to give me a kick every time I looked at it."

This man Clark photographed Tom Mix's pictures for seven years, and for a time was the great wild and woolly cinematographer at the Fox lot. But he says he was really the railroading cameraman, for he saw more of engine tops, brake rods and the sides of railroad cars than he did of the wide open spaces.

"That man Mix was always getting a railroad train into his pictures," said Clark, "and invariably we had to have our camera on some unheard of spot about the train. One day we would be fastened on the cow-catcher of the engine, dashing along with camera pointed up to the front of the engine where a battle would be in progress. The next day we would be on a hand-car in front of the engine, racing over the rails at terrific speed. Oh, there was not much horseback riding for us in those westerns.

"Once we had our camera out on the side of a passenger car on a platform that was hooked onto the side. As the train dashed through the mountain country the limbs of the trees along the track almost tore us off, but somehow or other we hung on and got our picture. It was a lot of fun, though."

Can you imagine fun in that? But, then, these cinematographers don't seem to mind danger a bit.

Another time Clark was on location in Merced Canyon with a Mix unit. A terrific rapids was the location and a girl was supposed to swim the rapids. Something went wrong and in no time the girl and four men were in the water struggling for their lives. Clark was with them. They lost the girl, and three of the assistants narrowly escaped drowning. Clark didn't tell us this, but it was his unusual knowledge of First-Aid methods that saved a couple of the other swimmers from death after they had been fished from the water.

For seven years Clark shot Mix pictures, a total of sixty-two of them. And he says he enjoyed every thrill in that time.

Clark is an unusual type. He has done a little of almost everything in his time. Born in Hermitage, Missouri, he drifted into the mining game as a metallurgist. He started the pioneer silver flotation mill of the country. He found his way into the business of being a butcher at one time. Then he became a baker—he says, boastfully, for a change, that he made good bread, too. Then he became a telephone switchboard man. Then he found his way into the army.

Finally, quite by accident, he broke into pictures as a handy man in the laboratory at Fox. From that he became an assistant cameraman and then a second, and then a first cinematographer, and then took over the duties of the Mix unit.

But he no longer films the westerns. He couldn't get away from all the excitement, however, so did the "Air Circus" which took him into the air. "Red Wine" is another of his pictures, a South Seas epic is another and "Why Leave Home" another.

Clark is an attractive type of man. He resembles a hard-boiled army first Seargent, but he has a heart of gold. Gruff in manner he is, but beneath it there is a friendliness and a charm that wins you immediately. And, like the other cinematographers, he is modest.

A Slip and It Is Tragedy Here

Above are shown a few of the dangerous and thrilling episodes in the camera work of Dan Clark, A. S. C. These odd camera locations were all used in making Mix pictures. Lower left is a home-made diving bell being lowered into the ocean with Clark inside it.

Emotional Appeal of Color

(Continued from Page 6)

and Afterglow which make with this color a series increasing progressively in warmth. It is mildly stimulating, suggesting a mood of lively interest and attention, but not one of high excitemen or nervous tension.

Tint No. 5, Candleflame. A pastel orange-yellow. It is slightly lower in transmission (75 per cent) than Sunshine giving a screen more orange in hue and lower in brilliance which definitely suggests artificial illumination when used on interior scenes. Somewhat warmer than No. 6. Possibly useful on exteriors in suggesting morning or afternoon with less intense sunlight than prevails at midday. By objective association useful in inducing rather mild mood reactions such as feelings of coziness, comfort, intimacy, well being, peace and plenty without opulence, etc.

Tint No. 4, Firelight. A soft yellow-orange. This is warmer than Candleflame to which it is closely akin in mood reaction value. The lower transmission (66 per cent) gives a somewhat less brilliant screen and this with the more orange hue makes it particularly adapted for use on an interior scene where it is desired to suggest an artificial illumination softened and subdued perhaps by shaded lamps and candles. It is suggestive also of illumination emanating from an open fire; but is not quite orange or red enough to satisfactorily render the fire itself if visible, for which Afterglow is perhaps better. It stimulates mood reactions of the same category as Candleflame but with greater intensity. Suggestive of warmth, comfort, intimate home relationships, mild affection, etc.

Tint No. 3, Afterglow. A soft rich orange color. It is probably the warmest color of the series. It is appropriate to exterior scenes at dawn and sunset. It lends to interiors an atmosphere of warmth and intimacy stronger than firelight. It should excite good reactions in general connected with luxury, wealth, security, and relatively strong affections. It is also related to the autumnal mood by obvious direct association with the autumn colors of nature. By indirect or subjective association it is symbolic of the same relative period in the life of an individual and its associated moods. It is indicative, therefore, of repose, ambitions attained, accomplishment, and similar psychological aspects of maturity.

Tint No. 2, Peachblow. A delicate flesh pink. This has a small, but definite blue content, making it somewhat less warm than Afterglow. It is adapted to the rendition of close-ups where it is desired to do full justice to feminine beauty. The hue and saturation are such as to suggest the glow of life.

Tint No. 1, Rose Doree. A deep warm pink suggesting sensuousness and passion. Amorous, Romantic, and Exotic. It is adapted to the rendition of scenes representing an intimate atmosphere such as a luxuriously appointed boudoir. In keeping also with feeling of happiness, joy, and excitement.

Tint No. 7, Verdante. A pure green, rather pastel in character. It is the hue of spring foliage suggesting directly trees, grass, and vernal landscapes. By subjective association typical of youth, freshness, unsophistication, innocence, etc. It is only slightly warm, but definitely not cold. It is very close to the neutral point in the warm-cool scale.

Tint No. 8, Aquagreen. A brilliant blue-green. The color of more northern waters and suitable to the rendition of the sea under clouds and in storm. It is suggestive of wetness. Its transmission (40 per cent) being lower than that of Verdante, it gives a less brilliant screen. This together with its greater blue tint probably makes it more suitable for the rendition of the darker green of mature summer, foliage, dense forests of pine, jungles, etc. By extension from the objective correlation to summer it is suggestive of such mood reactions as pertain to maturity, wisdom, dignity, repose, and restfulness. It is cool but not cold; tranquil, but not subduing.

Tint No. 9, Turquoise. A clear brilliant blue. It is definitely cool, but less cold than Azure or Nocturne. The visual transmission (43 per cent) is high for a blue of this hue but low as compared to the warm colors. This gives a screen of depressed brightness which together with the hue tends to produce a mood of peace, reposefulness, and tranquility. It is the color of calm tropical seas under clear skies. It is suggestive of the Mediterranean and the South Sea Islands. If used on interiors it should impart a feeling of restfulness, dignity, and reserve without inducing appreciable depressive moods. With proper contextual influence it might be used for the suggestion of brilliant moonlight effects although No. 10 may be somewhat better for this purpose.

Tint No. 10, Azure. A strong sky-blue. It is colder than Turquoise; tranquilizing to the point of becoming depressing. The visual transmission (28 per cent) is relatively low and hence gives a screen of low brightness. It is suggestive of the sedate and the reserved, even approaching the austere or forbidding; under certain conditions slightly gloomy.

Tint No. 11, Nocturne. Deep violet-blue. The visual transmission is low (28 per cent) giving a screen of low brightness. It definitely suggests night, shadows, gloom, coldness, etc. By subjective associational reactions appropriate to depressive conditions, despair, failure, unattained ambitions, intrigue, the underworld.

Tint No. 12, Purplehaze. A bluish-violet or lavender, rather pastel in character. It has a relatively high visual transmission (40 per cent) giving a screen of greater brilliance, higher key, than the adjacent tints, Nocturne and Fleur-de-lis, to both of which it is closely related in emotional value. The mood induced by this color is particularly dependent (more so than many of the other colors) upon contextual factors. For instance, to a twilight scene on the desert with distant mountains it imparts a feeling of distance, mystery, repose, and languorous warmth; while used on a scene containing snow fields, glaciers, snow-capped mountains, etc., it has a pronounced cooling effect. The hue of this color is approximately the same as that of the shadows on sunlit snow under a clear blue sky.

Tint No. 13, Fleur-de-lis. A rich royal purple. This color has long been the badge of royalty, high office, power, and pomp. In ancient times the dye was very costly and was used to color the garments of the aristocracy. The transmission of this film tint is low (25 per cent) thus giving a depressed screen brightness suggestive of reserve, dignity, and austerity. It has a relatively cool color but not as cold as Nocturne.

Tint No. 14, Amaranth. This is also a purple but has a greater red content than Fleur-de-lis, therefore it is warmer. Appropriate to king and court in a benevolent, smiling, happy mood, less austere and dignified than is suggested by Fleur-de-lis. It is adapted to the rendition of scenes showing opulence and luxury together with refinement. With proper contextual relation it may be well adapted to scenes approaching sensuality and abandon, such as bacchanalian revels when staged in settings of wealth, luxury, and elegance.

Tint No. 15, Caprice. Cool pink. Visual transmission (53 per cent) relatively high, thus giving a brilliant sparkling screen. Mardi gras, fete days, and merry making in general. It is mildly exciting and exhilarating in an innocent fun-loving sense.

(Continued on Page 38)

Klieglights

(Continued from Page 21)

range of from 5′ 9″ to 8′ 5″, or demounted for carrying aloft. A device on the yoke and hand clamps provides means for holding the projector securely in any set position. A dimmer on the base permits full or gradual control of the light from black-out to full-brilliancy.

KLIEG SIDE-FLOODLIGHT (No. 1153) is a high-intensity variable-range floodlight giving an evenly-diffused brilliant light for general illumination; projecting the beam usually in a horizontal direction or at a slight angle above or below the horizontal; used as a side lamp for general lighting of deep studio sets and close-up photography; accommodates a 1000,- or 1500-watt P S 52 Mazda lamp.

Projector consists of a deep, glass-lined reflector fitted with a mogul-screw-base receptacle, assembled in a sheet-metal housing, supported by a yoke; mounted on a telescopic pedestal, and set on a base equipped with ball-bearing, rubber-tired casters so that it may be easily rolled about.

Reflector is of parabolic contour made of spirally-rifled heat-resisting glass, giving directional control and diffusion of the light beam. A mogul-screw-base receptacle is set back of the reflector to accommodate the lamp, and a sheet-metal housing affords protection for the glass reflector and the lamp.

Reflecting unit is mounted in pivot bearings, so devised that the lamp is perfectly balanced, and can be turned in any direction. Hand clamp on the yoke affords means for clamping the lamp in any angular position.

The reflector may be raised or lowered within a range from 4′ 8″ to 6′ 8″, or can be demounted for carrying aloft. Standard and yoke are of tubular construction, fitted to a light cast-iron base with the upright held securely by guy rods. The snap switch is encased in the receptacle housing.

KLIEG TWIN-FLOODLIGHT (No. 1150) is a wide-spread high-intensity floodlight for general illumination, projecting an evenly-diffused light over a large area; used for lighting foregrounds, close-ups, and general lighting of studio sets; accommodates two 1000-watt or two 1500-watt P S 52 Mazda lamps.

Projector consists of an all metal box reflector fitted with two screw-base receptacles; mounted on a telescopic pedestal, set on a base equipped with ball-bearing, rubber-tired casters, and so designed as to allow variations in the projection of the light in every direction, adjustments in height, and to roll easily over the floor.

Reflector is a spun aluminum set in a deep, open-front, sheet-metal box. The contour of the reflector is parabolic, giving directional control of the light, and its surface has been chemically treated to produce controlled diffusion of the light. The receptacles are placed well toward the rear, with the lamps close to the reflector.

Provisions have been made for ample ventilation—and slide grooves on the front permit the use of a diffusing screen. Special bracket mounting allows angular variations in a vertical plane, and telescopic pedestal permits head to be raised or lowered from 5′ 3″ to 7′ 5″, turned in any direction, or demounted, and set on a short pivot on the base with beam center 26″ from the floor.

KLIEG SPOTLIGHT (No. 8 N 22) is a high-intensity, long-range spotlight for use with incandescent lamps; projects a concentrated beam of light any distance up to 100 ft., gives a 3-ft. spot, or a wide spread; and is used in the studio for: back lighting—to give depth to the picture; cross lighting—to eliminate facial shadows; spotlighting, follow-up floodlighting, modelling, and for special lighting effects; accommodates a 2000-watt concentrated filament G 48 Mazda lamp.

Spotlight is flexibly mounted on a telescopic pedestal stand; can be set at any angle, raised, lowered, or turned in any direction; and the base is fitted with casters permitting it to be rolled easily over the floor.

Lamp housing, 22-inches in length, is light-tight, thoroughly ventilated, and equipped with: an 8-inch condensing lens—so supported as to allow unrestricted expansion of the glass to avoid breakage; a mogul-screw-base receptacle—mounted on a sliding base, with a vertical adjustment for centering the light source, and a rod extending through the rear of the housing for focusing; a concave chromium-plated reflector—mounted back of the lamp to insure full utilization of the light source and to intensify the light beam; a large, self-closing spring door—on one side of the hood which permits easy access to interior for changing lamps; and slide grooves—on the front of the hood for holding iris shutter, or other devices used in obtaining special lighting effects.

* * * *

A folder describing these units in detail, can be obtained by writing to the manufacturer—Kliegl Bros., 321 West 50th St., New York City.

Cinophot Handy

WITH the arrival of summer's intense light movie makers find it difficult to decide what light conditions calls for f.16 or f.8 on their Ciné-Kodak. These amateurs will find the Cinophot a useful and handy article to have with them. It is a tried exposure meter, and a valuable accessory.

The Cinophot resembles a small telescope. In use, it is placed to the eye and pointed at the scene to be photographed. If the light is at all suitable, the Ciné-Kodak speed figure 1/32 will show in the meter. A quick turn of the iris collar on the Cinophot extinguishes this figure. The iris is then turned slowly back until the figure shows very faintly. The index number on the outside of the Cinophot then shows the correct diaphragm stop for the prevailing light condition.

The Cinophot is packed in a sturdy sole leather case, and is so small and compact that it can be carried in a coat pocket. Complete, with case and instructions, it is on sale at all dealers and the price is attractive. The Dremophot is also as valuable if you have a Filmo.

Emotional Appeal of Color

(Continued from Page 36)

Tint No. 16, Inferno. Fiery red tinged with magenta. Since it is directly suggestive of fire, it is adapted to scenes of burning buildings, glowing furnaces, forest fires, etc. By subjective association indicative of riot, panic, anarchy, mobs, turmoil, strife, war, battle, and unrestrained passion.

It is not desired that the reader shall gain the impression from this rather enthusiastic discussion of the potential emotional value of color that the lavish and unrestrained use of color treatments is advocated. On the contrary, it is desired to emphasize the necessity of using the color accompaniment to a motion picture production with care and discretion. The use of too strong or saturated colors is in general not good since such colors are usually obtrusive and distracting and may defeat, rather than promote, the attainment of the desired effect. A more subtle method will yield better results. This involves the employment of pastel tints which may be increased in subjective strength for a brief period of time by the action of successional contrast or juxaposition in time. Thus the eye accommodated to, or fatigued by a green, such as Verdante, will perceive, at the beginning of the following scene done on a pink tint, a color of enhanced subjective saturation. This immediately fixes the mood of the scene after which the accommodational processes in the retina begin to operate and cause the effective saturation to decrease appreciably. Thus the color having fulfilled its mission, saying definitely that this scene has a specific emotional atmosphere, fades into the background, and while continuing to make itself felt in the subconscious mind of the observer by lending a warmth and softness to the scene permits the action to carry forward the dramatic sequence without the unpleasant and distracting influence of pronounced color.

There are perhaps some who may question the advisability of attempting to use color on the screen as an aid to the creation of an emotional atmosphere on the ground that individuals react differently to the same color. Is it not true that the same musical composition may excite widely different feelings in individuals, and that the same word or phrase may convey to different minds widely divergent ideas? Perhaps it will be necessary to spend much time and effort on the development of a language of color, to compile dictionaries with definitions of the symbolical, associative, and emotional values, just as we write and agree upon definitions of words in order that specific ideas may be conveyed from one mind to another by spoken and written language. If there is in the human mind, or, more specifically,, in the collective mind of the motion picture public, a color consciousness even though it be at present latent or but slightly developed, is it not worth considerable effort in thought and experimentation to develop a technic such that color can be applied to the screen in such a way as to enhance the emotional and dramatic values of the motion picture of the future?

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American Cinematographer Opens Chicago Office

The AMERICAN CINEMATOGRAPHER has opened an office in Chicago. This office is in the capable hands of Daniel J. Goff, who has been in the cinematographic and publication business in that city for the past seventeen years. Mr. Goff took over the representation of the magazine on August 1.

Mr. Goff is located at 3668 South Michigan Avenue, and at all times will be available to assist advertisers and readers of this magazine in any and all ways. It is the aim of this magazine to give the greatest possible help to amateurs, and the Chicago amateurs will find Mr. Goff ready and eager to do anything he can to aid them. His office telephone is "Boulevard 5444.'"

Sound Men and Cinematographers Discuss Problems

(Continued from Page 8)

single camera has several frequencies and various harmonics rather than a noise like a motor hum. By the time all these frequencies were filtered out you would have nothing left to properly record music or even the voice.

Question 5.—(a) Masking microphones, except in rare cases, is a bad business, and every attempt should be made to make this practice unnecessary.

(b) It is not so much the design of the microphone as it is the design of the set. It seems to be a question of relative distances between the speaker and the microphone and the microphone and the walls. The answer does not lie in the question of microphone development. It is a question of set acoustics and reverberations. As a general rule, the further away the microphone is placed from the speaker, the poorer the speech.

Question 6.—(a) and (b) These questions are answered together. Since the picture to have the proper contrasts and balance should have a higher gamma than the sound track, it is necessary for the cinematographer to add a certain degree of contrast to his lighting so that the picture will look right even though development is designed to secure an overall gamma of unity, which is considered the proper development for the sound track.

However, since in most studios the picture negative and sound track negative are developed separately, this matter is no longer a problem.

The consensus of opinion was that the negative sound track should generally not be developed to more than a gamma of .6—this would enable the laboratories to develop their positives in the usual manner without being forced to overdevelop the picture negative to a point where graininess and other defects might appear in order to get the proper pictorial contrast in the positives when the picture and sound track are printed together.

Question 7.—(a) It would give much greater freedom to the cinematographer, eliminate booths and other cumbersome sound apparatus. The consensus of opinion was that it would be a great step forward in the making of the talking pictures.

(b) Many of the technical difficulties in the development of a satisfactory directional microphone were discussed at length, and it was brought out that great advantage could be gained by the development of such a microphone. It was also brought out that manufacturers are striving to produce a satisfactory device.

Miscellaneous Questions

There was much difference of opinion as to the relative merits of sound on wax and film. But the consensus of opinion was that if equal quality could be obtained by recording on film, the greater simplicity of film recording apparatus, together with certain advantages that this type of recording has for the cameraman and cutter, the sound on film system would eventually be employed by all studios.

For sound reproduction in the theatres, proponents of both the film and disc methods gave logical arguments in favor of their relative systems. After much discussion the majority of critical opinion seemed to favor the disc method as being more practical for a majority of theatres—at least for the present. Discs can be replaced at small cost, and while the film can be used longer, the relative cost of replacement is very high. The discs with certain deficiencies in the low frequencies sound better because of this deficiency in theatres with poor acoustic properties. Altogether, it was felt that film recording would eventually be employed in all studios for making the records, but, for the present, the discs seem more practical for the theatres.

A complete account of the discussion between the sound engineers and cinematographers will be printed in the CINEMATOGRAPHIC ANNUAL, which is now in process of compiliation. The entire proceedings of all such meetinfs will also appear in the same ANNUAL, orders for which are now being taken at the office of the AMERICAN CINEMATOGRAPHER. This ANNUAL will be published by the A. S. C.—EDITOR'S NOTE.

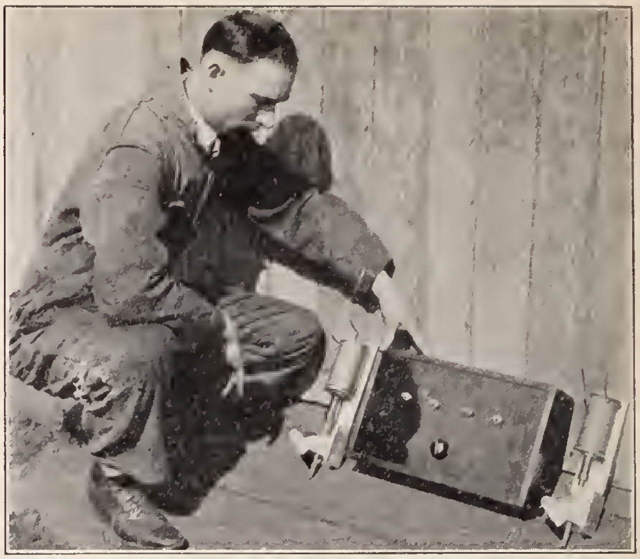
Mitchell Camera Corporation Moves to New Home

ANOTHER outstanding milestone in the history of the Mitchell Camera Corporation was passed on July 5 when this Hollywood organization moved into its new home at 665 North Robertson Boulevard, West Hollywood.

Starting eight years ago in the manufacture of the Mitchell Camera, this organization has grown and prospered in a remarkable manner, and today is housed in a plant that is second to no industrial establishment in the country from the point of view of efficiency, beauty and comfort to the workmen, and is a fit monument to the ability and progressiveness of President Hy F. Boeger and Secretary George H. Mitchell, who have guided the concern since its inception.

Ground for the new plant was broken on January 21, 1929, and the erection of the building has been a rapid bit of construction work. The plant, which houses offices and factory, contains 26,000 feet of factory floor, and is of concrete, steel and glass. The floors are of sawed wood blocks set in concrete slabs for the comfort of the workmen. Every known modern convenience is found in the plant, which is the last word in industrial construction.

In next month's issue of the CINEMATOGRAPHER will appear pictures and a detailed story of the new plant. At the present the AMERICAN CINEMATOGRAPHER and the A. S. C. congratulate Mr. Boeger and Mr. Mitchell and their associates on their great progress and on their magnificent plant.



Automatic Projector-Operator and H. J. Fenner, inventor.

New Automatic Projector-Operator Announced by Portland Firm

THE aim of all exhibitors, big or little, is to achieve perfection in projection at each and every performance at their motion picture theatres. While it is true that the combination of "weak" pictures and perfect projection will not make a high-grade show, it is at least a known fact that perfection in projection does make a poor picture more satisfactory to the audience.

Ill-timed change-overs break the continuity of a feature, thereby causing the audience's interest to lag. Long delays from film breaks, not to mention the possibilities of fire from such an occurrence, tend to make more grief for the exhibitor.

"Trifles Make Perfection. Perfection Is No Trifle," said the great Angelo. And with this thought in mind, Howard J. Fenner has invented a new Automatic Projector-Operator which its backers declare will revolutionize the projection of motion pictures.

"The purpose of this machine, which is fully covered by patents," says the announcement, "includes four essential features: It automatically accomplishes the change-over from the the picture being shown. Moreover, the audience is not conscious of the change, which always takes place at the same point projector in operation to the one carrying the successive reel of in the program. Second: It automatically stops the projector in case of a film break. Third: It automatically cuts out the burning light rays of the projection arc by means of a shutter that closes the light hood. Fourth: The machine will start the turntable motor of the talkie apparatus any length of time ahead of the change-over, thereby allowing the record to attain full speed at the time the change-over is made.

"The outstanding features of the apparatus are that it automatically effects the change-over and continuity of the picture from one projection machine to the other. This feature is doubly valuable," continues the announcement, "as it *does entirely away with an extra human operator*. The change is perfection—far more so than any change that could be made by the most expert hands. Once correctly timed the synchronization is the same at every performance.

"In the case of the film break the automatic stop feature prevents over rotation of the winding reel, which heretofore has caused much damage to the film and excessive delay in repairing the break.

"The fire hazard that exists when these breaks occur is worthy of intelligent consideration," says the inventor, "particularly by the small exhibitor. Not only is the danger of serious fire losses from burning film entirely eliminated, but the insurance rate is also affected."

The Automatic Projector-Operator is being manufactured in Portland, Oregon, by the Automatic Projector-Operator, Inc., 322 Corbett Building, from whom additional information may be obtained. Robert B. McElroy is president.

Professional Equipment Devised for Amateur Cinematographer

The most outstanding bit of news in the amateur field in the past month is the announcement by the Movie Specialty Manufacturing Company of 1361 South Flower Street, Los Angeles, of three new devices for the use of the amateur cinematographer.

These devices are a Matte Box, a Micro-Focus-Meter and a Title Hood. The devices are the creation of O. W. Heinz, and bear his name.

To those Amateurs who aspire to do the things with their cameras that the professionals do with theirs we unhesitatingly say that the Heinz devices will be a revelation, and after seeing what can be done with them we do not hesitate to state that the serious-minded Amateur who wishes to do more than merely make snap-shots will be making a wise investment if he procures any of these new articles of equipment for his use.

Time and again one hears an Amateur saying he wishes he could do this trick or that with his camera. Now, with this matte box, micro-focus meter and title hood untold accomplishments are possible. Fade-outs, dissolves, double and triple exposures, fog and moonlight effects, vignetting, and titles with animated backgrounds are all at the command of the amateur with these devices.

The micro-focus meter is a device which assures correct focus and exposure and adds the professional touch. The images are erect and not upside down, and it is magnified either 15 or 22 times.

In the matte box the Amateur who wishes to add the professional touch to his work will find an adjustable iris, a complete set of filters, and a group of horizontal dividers which make possible tricks that heretofore the amateur has only hoped for.

The title hood is a simple device, but one which will be a boon to Amateurs who wish to make titles that are something more than mere printed cards. With this title hood, for example, an Amateur can picture the foamy waves breaking on a rocky shore and gradually dissolve his title into this shot with the waves in the background. It is equipped with a title guide, semi-transparent cards for positive titles, transparent cards for double effect trick titles, title fluid, and directions for making more than 50 styles of titles. For artistry in title making serious-minded Amateurs will find this device one of the most valuable pieces of their equipment.

O. W. Heinz, the creator of these devices, is a man who spent years in the manufacturing end of the automobile business. He is a mechanical engineer of unusual calibre, and after a long period of consideration, turned his creative powers into the Amateur cinematographic field, and is applying the same serious thought to devising equipment for the amateur cinematographer that he formerly put into creating improvements in mechanical construction of the motor car. With his fresh point of view, he readily saw what the Amateur needed and his three devices are the result. He is now at work on a new amateur 16 mm. camera.—(THE EDITOR).

This illustration shows the Akeley Gyro Tripod in actual use by the Western Electric Company, taking sound moving pictures.

Again AKELEY

. . . anticipated necessity
with a tripod ideal for Sound Pictures

"GIVE us the best camera tripod that human ingenuity can devise!" This was the demand of the sound cinematographers.

It was characteristic of the Akeley Company that its research laboratories had already anticipated this demand and were putting on the market such a tripod—a tripod quiet in operation, capable of great speed and flexibility, vibrationless but light, staunch yet easy to manage.

The Akeley Universal Gyro Tripod, containing the famous gyro mechanism, stands today a leader in this latest field of photography. This tripod is in constant use in many leading motion picture studios making Sound Pictures. These studios include Metro-Goldwyn-Mayer, Fox-Case Movietone, Pathe and Paramount. Other world wide corporations, such as Radio Corporation of America, Westinghouse Manufacturing Company, Western Electric Company and General Electric Company are enthusiastic users of the Akeley Gyro Tripod in their important work. We invite you to write for full description of this Tripod and details of our deferred payment plan.

AKELEY CAMERA INC.

175 Varick Street New York City

The Akeley Universal Gyro Tripod

"Success"

(Continued from Page 9)

the remains of his morning meal, made up his cot and brushed the floor. Then, from an old trunk in the corner he extracted a large envelope. With trembling hands he untied the string which bound it, and withdrew a picture and a letter. The picture was that of a woman in her thirties. Apparently she had once been very beautiful; but there were deep lines of care about her mouth and forehead.

For a long time the old man gazed at the picture. Then he slowly opened the letter.

"Charles—I love you, darling, but I can't go on. I can't continue starving while you do nothing but fail—and promise success. For twelve years I have tried it. I am worn out. I can't go on. Forgive me . . . Agnes."

The old man picked up the photograph again. For perhaps a minute he looked at it. Then, as two great tears rolled down his cheeks, he clasped the picture to his breast.

"Agnes, Agnes," he cried. "I told you I would succeed sometime. I told you I would not always fail."

In a few minutes he was calm again. He placed the picture and letter in the envelope and returned them to the trunk. Picking up his make-up box, he left for the studio.

"NOW then, Pop," said the director, "Your part describes you as a retired banker. Your youngest son has gotten into jail for about the fiftieth time. You discover this while reading your paper in the library. You must register great wrath. Call in your eldest son and tell him to get your lawyer as you are to cut your boy out of your will without a dime. You raise your hands on high and start to curse him. But right then you fall back in your chair with a paralytic stroke."

The scene was rehearsed a half dozen times.

"All ready," said the director.

The old man was rising to the occasion remarkably, much to the relief of all for he had been given the part solely because there was no other actor in the city to fit the character.

"Cut," shouted the director, as the old man fell back into his chair.

"Marvelous work, Pop," he added. "We should have had you in our last picture instead of that wooden-headed lump of clay we brought on from Hollywood. Why you are going to be a success in your old age."

The old man smiled from his chair.

"Guess we'd better have a closeup of that," added the director.

The cameras were moved up and the electricians were trimming the lights. But the old man sat still in his chair.

"All right, Pop," said the director. "Let's get going for a closeup." The old man did not move.

"Say," exclaimed the director, "What do you think this is, a sleeping porch! Just because you made good is no reason why you should take a nap between scenes."

"THIS is getting to be a hell of a business" remarked the director a half hour later. "Give an old simp a chance to make good, and he dies in the middle of his picture."

But the director never dreamed that the old man had reached his goal.

Amateur Movie Making

(Continued from Page 27)

though they are so valuable to the cinematographer, they are not proportionally costly. Anyone who is reasonably handy with tools can easily make his own, and the others can have them made very cheaply. In their simplest form, they are merely large sheets of smooth-surfaced compo-board, sized, and coated with aluminum leaf. This makes the so-called *hard* reflector, which reflects the maximum of light. The *soft*, or diffuse reflector is about the same, but with a matte surface. Either of these will do well with any kind of film, though some studios use gilt or bronze-surfaced ones with panchromatic stock. For convenience and protection the studios usually place a light wooden frame around the edges, and hinge a prop on the back, so that the reflector may be supported at the proper angle, and need not be held by hand.

For amateur use, at least three reflectors should be used: preferably two soft and a hard. Four—two of each kind—is a better assortment, and hardly more expensive. It takes only a little practice to become skilful at lining up reflectors on a subject, and the results amply justify the slight additional trouble incident to their use, for they eliminate or lighten unpleasant shadows, and enable the cinematographer to paint with light as surely outdoors as he does within—and without the cost of current, etc., that often harasses the maker of home interiors. So far as is known, the only price of using the sun for a lightplant is an occasional sunburn!

Mrs. Herbert Hoover Now Member of Amateur Club

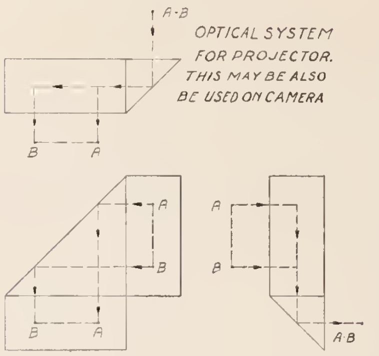
To the Amateur Movie Club of Waterloo, Iowa, goes the unusual honor of having as a member the First Lady of the Land.

Mrs. Herbert Hoover, who was born in Waterloo, was recently elected to life membership in the club. Incidentally, the club claims the distinction of being the first amateur club to be organized in Iowa. Mrs. Hoover is an ardent amateur, and the club rightfully is proud to have her as a member.

Wide Image

(*Continued from Page 17*)

plane. One of the worst objections to the present size picture is the fact that it has lost, in a large measure, the quality of naturalness. Normal vision subtends an angle that is approximately twice as wide as it is long. This horizontal angle is somewhere in the vicinity of 100 degrees with a vertical angle of about 50 degrees. The standard motion picture, as projected today, appears almost square and this is one of the reasons why present pictures do not appear natural on the screen. The horizontal dimension is not correctly proportioned to the vertical height of the picture.



In double-width film, with which some firms are experimenting, there are many disadvantages. With film of that width special equipment is needed from the start of manufacture of the film until it is shown on the screen. If this double width film comes into general use it will require the scrapping of all the motion picture equipment now in use, with a cost of millions of dollars. It seems to me, after many years of experience in the film industry, that the scrapping of so much equipment is impractical.

However, a change in size of the picture is necessary. Also in the size of the sound track. The present size of the picture is not wide enough to give absolute fidelity of reproduction. Due to its narrow width any weaving of the film while passing the aperture which permits light to pass through the film to the photoelectric cell will cause a change of tone in the reproduced sound. This is often objectionable. The recording of the higher frequencies of sound presents another problem. This has only been partly solved. Sound engineers have increased the speed of photography from 18 to 24 pictures per second. This was done to give a longer sound track. At 24 pictures per second the film travels at the rate of 90 feet per minute, or 18 inches per second.

When a ribbon light-valve is used with an aperture of .004 of an inch the highest frequency that can be recorded is 4/18.000 or 45.00. This is about the highest frequency succesessfully recorded by the variable density method. This comparatively low frequency cuts off many of the harmonics of speeech and sounds. This gives rise to the complaints of "tinny or canned" music.

The use of double width film only partly overcomes this difficulty, for although a wider sound track is used the film does not move at a much greater speed than the present film. To be exact, the increase in speed of the wide film is represented by the fraction .936/.750 which is not great enough to eliminate the present rerecording difficulty.

With my method this difficulty is overcome for my method provides a sound track twice as long as at present, and at the same time gives an image twice as wide as the standard—and remember, it is on *standard* size film with standard machinery. For this reason I feet justified in believing that my method will be a boon to the industry, something that will advance the art of the motion picture.

Hints on Kodacolor

FOR THOSE readers who wish to take advantage of the colors of summer and make pictures with Kodacolor film, we print the following excerpt from Ciné-Kodak News. A few simple rules are given, and should be of assistance.

To begin with, make sure that the Kodacolor Filter is properly inserted in the lens barrel. Move the diaphragm pointer to *f*.1.9 and insert the little key on the filter into the slot in the lens barrel. Then push the filter *all the way down.*

With *each* roll of Kodacolor Film a ratio diaphragm is included. This is a small metal ring of special shape that is to be used on the Kodacolor Filter with that particular roll of film. If the ratio diaphragm used is not suitable for that roll of film the proper color balance will not be maintained and the effect on the screen will be unsatisfactory.

When reloading the Ciné-Kodak with Kodacolor Film, compare the letter on the ratio diaphragm included with the film with the one on the filter that was used with the last roll of film. If the letter is the *same*, discard the ratio diaphragm included with the fresh roll of film; if it is *different*, replace the old ratio diaphragm with the new one.

Be sure that you focus accurately *for every scene*. If you are not a good judge of distance, it is advisable to use a tape measure for close-ups, to insure accurate focus.

Be very sure, of course, that you have direct, bright sunlight when you attempt Kodacolor pictures with Ciné-Kodak, Model B. Owners of the new Ciné-Kodak, Model BB, will find the half-speed feature of this camera valuable for making Kodacolor pictures when the sun is not bright.

The neutral density filter should be used for scenes where the light is *exceptionally bright*, such as distant sea or sky scenes, all beach scenes, and distant landscapes and mountains. Full-length or half-length portraits, when the subject is dressed in a white or very light-colored costume, should be made with the neutral density filter.

In the tropics, the neutral density filter should be used on all evenly lighted subjects in sunlight without deep shadows. Whenever deep shadows appear on the subject and for all close-ups, the neutral density filter must *not* be used. This is important.

It is advisable to have your Kodacolor Film processed as soon as possible.

Here's One for Golfer's Book

No need for expensive golf lessons now—thanks to the movies. Bell & Howell Filmo Library offers the golfers something interesting in the way of golf lessons. There is one series by Harry Cooper which consists of a separate 100-foot film lesson on each of eleven clubs. Another series teaches golf by the analytical method of Joe Novak, and shows Novak himself giving lessons. This series includes four 100-foot films which may be had either separately or on one reel.

Many beginners in golf, and some whose beginning has been all wrong, are finding these lessons of much value.

However, another suggestion is offered. Let the golfer have slow movies taken of himself with his Victor Cine-Camera, Model 3-T. Then all he has to do is run the Novak picture and then his own. In this way he can see his mistakes. A series of these pictures would be interesting for the golf beginner to look at in future years.

An interior view of the new plant of the Cinema Equipment Company, 7160 Santa Monica Boulevard, Hollywood.

Death Claims Alvin Knechtel

THE AMERICAN SOCIETY OF CINEMATOGRAPHERS and the motion picture world as a whole suffered a distinct loss on July seventeenth—a loss that can never be made up. And at the same time the world lost a real man. This man was Alvin Knechtel. The only consolation for his widow, family, associates and friends is found in the fact that Alvin Knechtel died "with his boots on" — Died as he had often said he hoped he could do—died at his work with no knowledge that death wat at hand.

Alvin was killed while driving his own beloved airplane in line of duty for his firm, First National Pictures.

He had been seriously ill for more than a week. Leaving his sick bed, he went back to work and because of the fact that air work on a production was being delayed, he insisted upon taking his plane aloft for preparatory work.

Known in the industry as one of the best air photographers, Knechtel also held the unique distinction of driving his own plane until he was in position to "shoot." Then he would turn the controls over to a pilot and go to work. On July seventeenth he took a "stunt" man, William Hauber, with him and left the ground. He was ill, but his duty overcame his physical weakness. Suddenly he stiffened and apparently fainted, according to the pilot of a plane flying near his, and slumped over the "stick." The plane went into a spin. When the remains of the plane were dug out of the ground the bodies of the two men were found. And Knechtel had died while on the job.

Alvin Knechtel

Knechtel was born in Ontario, Canada, on May 24, 1901. He has had a long and both interesting and brilliant career. He started his cinematographic work in 1915 in a little commercial laboratory in Detroit. He soon was assigned to a camera and during the next four years made several five-reel pictures.

In 1919 he was sent to the South Seas by Famous Players during which trip he made nine pictures for the "Paramount Magazine."

On his return he went with the Banner Productions for a time and then free-lanced, producing his own short subjects. He sold much to Pathe with the result he soon joined their staff. He did many notable pieces of work for them and finally evolved a method of producing multiple image and trick novelty photography which placed him in the top ranks of trick cinematographers.

At First National he was an outstanding genius in his line. To replace him will be a big job. Smiling, optimistic, always working — Knechtel was one of the best liked men in the industry.

He was second vice president of the A. S. C., a member of the Board of Editors of the AMERICAN CINEMATOGRAPHER, and chairman of the A. S. C. Research Committee. With his passing the A. S. C. loses one of its most loyal members and one of its finest gentlemen; and a gap is left in the Society's ranks that never can be refilled, for there are no more Alvin Knetchels. The deepest sympathy of every member of the A. S. C. is extended to his widow who has lost a wonderful husband, a sympathetic companion and a real man.

Fine Grain Developer

(Continued from Page 18)

the quantity of sulfite which is used up is relatively small. It is obvious therefore that a solution for reviving the developer should at least contain all these ingredients. In practice it was found with the rack and tank method of development that the developer could be revived by adding half the original quantity of Elon, hydroquinone, and borax, together with a small quantity of sulfite after 80 feet of film per gallon had been processed. These were dissolved in as small a volume as possible of a 10 per cent sodium sulfite solution before adding to the developer.

Curve C (Fig. 6) shows the effect of such revival. (Compare with curve B.) The condition of the developer after 160 feet of film had been processed is shown by curve D. (See also Fig. 7.)

The four curves, A, B, C, and D (Fig. 6) show that 160 feet of film can be processed satisfactorily per gallon of borax developer if it is properly revived at intervals. The revived developer gives the same gamma in a given time of development as the original developer, while the emulsion speed at this exhaustion point is fully 60 per cent of the original.

Tests were made by adding increasing quantities of potassium bromide to a fresh developer and measuring the speed loss. It was found that about 1.5 grams per liter of potassium bromide were required to reduce the speed of the emulsion to 60 per cent of its original value. This content of potassium bromide corresponds with the quantity of bromide present in the exhausted developer as determined by analysis. The quantity of potassium bromide present was determined as follows: The sodium sulfite and developing agents were oxidized in alkaline solution with sodium peroxide and ammonium persulfate. After acidifying, the bromide was precipitated with excess silver nitrate and the excess silver titrated with potassium thiocyanate with ferric nitrate as an indicator. This analysis showed a content of 1.6 grams of potassium bromide per liter in a developer exhausted with 200 feet of film per gallon.

Also a determination of the quantity of bromide liberated in the developer calculated from the quantity of silver left in the developed negative shows that the equivalent of from 1.0 to 2.0 grams of potassium bromide are liberated after developing 200 feet of film per gallon, depending approximately upon the integrated density of the negative.

(D) Sludging Properties of the Developer

Sludging is a normal and unavoidable characteristic of the borax developer. The sludge is made up mostly of finely divided silver and imparts to the developer a light gray muddy appearance. An analysis of dried sludge from a used developer which contained all the foreign matter which accumulated during the processing of 160 feet of film per gallon indicated a content of 40 per cent pure silver.

With the rack and tank method of development where a tank of developer is used over a period of two weeks or longer the developer contains a considerable quantity of sludge after 160 feet of film per gallon have been processed. In the experience of this laboratory the quantity of sludge which forms has never been sufficient to interfere with successful development.

With continuous machine development the sludge may accumulate in the bottom of the tank or tubes as a result of insufficient agitation of the developer. By circulating the developer through a storage tank, most of the sludge settles out in this tank. The suspended silver can also be removed by filtering through a bed of sawdust. The sawdust for this purpose must be extracted with boiling water before use to remove the soluble constituents which might change the characteristic of the developer. The various factors which determine the amount of sludge formation are discussed later under "graininess."

12. The handling of Motion Picture Film at High Temperatures by J. I. Crabtree, Trans. S. M. P. E. No. 19, 39 (1924); Brit. J. Phot. 71: 462 (1924).

A. B. C. of Sound

(Continued from Page 20)

act thus as a shutter of variable apertures, or changes the plane of polarization of a Kerr cell which has the effect of changing the intensity of the light striking a slit according to the modulation of the current. The final effect of these three systems of recording valve is to impress upon the moving film in rapid succession the image of a slit in variable densities.

(To be Continued)

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FOR RENT 1 8x10 Still Camera, focal plane shutter, complete, 1 Mitchell Friction Tripod, new, for B. & H. 1 Eyemo Camera with special lock. 1 4x5 Graflex B. & L. lens. 1 B.-H. Low Boy to fit new style B.-H. Tripod head. Joe LaShelle, 639 N. Sierra Bonita, ORegon 6730.

Quick, Watson! The Umbrella!

Here is one of Charles Clarke's stereoscopic shots, which will be a feature in each issue of this magazine for some time to come. This is a movie company shooting snow scenes. But Clarke doesn't tell us why the umbrella is in use. Cut out this picture and paste it on card-board and use it in your old-time stereoscope. We plan to give you a collection.

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Lundin, Walter—Harold Lloyd, Metropolitan.
Lockwood, J. R.—
Lang, Chas. B.—Paramount.
Lanning, Reggie—M.G.M.
LaShelle, Joe—
Lindon, Curly—Paramount.
Marsh, Oliver—M.G.M.
Miller, Arthur—Pathe.
Miller, Virgil E.—F.B.O.
Mohr, Hal—Universal.
McDonnell, Claude—London, Eng.
MacWilliams, Glen—Fox.
Meehan, George—Fox
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Milner, Victor—Paramount
Marshall, John R.—Fox.
Marta, Jack A.—Fox.
Merland, Harry—Paramount.
Nogle, George G.—M.G.M.
Oswald, H. M.—
O'Connell, L. Wm.—Fox.
Parrish, Fred—Colorado Springs, Colo.
Pahle, Ted—Paramount, New York.
Palmer, Ernest—Fox.
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Perry, Paul P.—United Artists.
Perry, Harry—Caddo Prod.
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Walker, Joseph—Fox.
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Wyckoff, Alvin—United Artists.
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Wenstrom, Harold—
Whitman, Phil H.—
Wilky, L. Guy—
Warrenton, Gilbert—Universal.
Williams, Frank D.—
Westerberg, Fred—United Artists.
Young, Jack R.—M.G.M.
Zucker, Frank C.—Photophone, Inc., New York.

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Patsy Ruth Miller

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Goldstream, near Victoria, British Columbia

Some Properties of Fixing Baths

Part One of an Unusually Interesting and Informative Paper Presented at Spring Meeting of S. M. P. E. at New York City, May 6-9, 1929

By J. I. CRABTREE *and* H. A. HARTT

[This paper, which is Communication No. 396 from the Kodak Research Laboratories, Rochester, N. Y., will be published in three parts. The second installment will appear in the October issue. —*Ed. Note.*]

OF THE various types of fixing baths available, the potassium alum-acetic acid-sulfite fixing bath is employed to the greatest extent in modern motion picture film laboratories. Fixing baths containing chrome alum and, to a lesser extent, formaldehyde are also employed, but a description of the properties of such baths will be reserved for a future communication.

So far as is known, A. Lainer[1] was the first to suggest the addition of alum and sodium sulfite to a solution of hypo for fixing purposes but such a bath sludged very readily on the addition of developer. The authors have not been able to establish who was the first to suggest the addition of a weak acid to such an alum-sulfite mixture.

Although acid-hardening fixing baths have been extensively employed during the past thirty years, very little has been known regarding the precise effect of varying the proportion of the constituent chemicals or of the effect of use on their properties. It is the purpose of this paper to present some of the results of extensive research on the subject during the past few years in the Research Laboratories of the Eastman Kodak Company.

I. *Requirements for a Satisfactory Fixing Bath*

A satisfactory fixing bath must fulfill the following requirements:

(*a*) It should dissolve the silver halide emulsion on the film with sufficient rapidity and continue to do so throughout its life, without staining the film.

(*b*) Even at summer temperatures, during its life the bath should not precipitate sulfur. If film is fixed in a bath which is precipitating sulfur, more or less colloidal sulfur will be precipitated in the gelatin film which cannot be removed by washing. The sulfur will then combine with the silver image, causing fading[2].

(*c*) During its useful life, the bath should not precipitate aluminum sulfite. This precipitate forms as a result of the reaction between the alum and the sulfite when the acid in the fixing bath becomes neutralized by the alkaline developer carried in by the film.

It has been shown by Sheppard and Ballard[3] that this precipitate consists of basic aluminum sulfite, the ratio of sulfurous acid to alumina varying according to the conditions of precipitation. Throughout this paper the precipitate will be termed "aluminum sulfite."

(*d*) The bath should not produce blisters in the gelatin coating of the film. If the bath is too acid, on the addition of developer the formation of carbon dioxide gas proceeds too rapidly and gas pockets are apt to form within the gelatin layer which finally break, causing blisters.

(*e*) The degree of hardening of the fixed-out gelatin film should be satisfactory. Hardening of the film, however, is not necessary, provided the gelatin coating of the film does not swell excessively during processing so that it can be handled and dried satisfactorily.

Hardening primarily retards the swelling of the gelatin coating so that the film can be dried faster. In the case of unswollen and hardened film there is a minimum of water present in the film to be evaporated, while a higher temperature of the drying air can be employed without danger of softening or melting the gelatin coating. In case the film is handled by the rack and tank system[4], the gelatin coating of unhardened film is apt to be damaged during wiping or squeegeeing previous to drying so that hardening is usually desirable.

The addition of developer to the fixing bath also has a decided effect on the hardening properties of the bath. Therefore, the bath should be so compounded as to maintain as nearly uniform hardening as possible throughout its life in spite of the gradual accumulation of developer carried over by the film.

(*f*) The cost of the bath in terms of the quantity of film fixed in it should be as low as possible.

II. *Classification of Fixing Baths*

Two essential types of fixing baths are in common use, namely (1) non-hardening fixing baths; (a) plain hypo, (b) acid hypo; and (2) acid-hardening fixing baths.

1. *Non-hardening Fixing Baths*

A plain solution of hypo is quite satisfactory for fixing purposes provided little or no developer is carried over to it by the films. It is therefore necessary either to wash the film thoroughly after developing and before fixing, which is usually impractical, or to use an acid stop or rinse bath. In such a case, some sodium sulfite must be added to the hypo to prevent sulfurization by the acid carried over by the films from the stop bath.

Many motion picture laboratories employ non-hardening fixing baths with their processing machines. A satisfactory formula is as follows:

	METRIC	AVOIRDUPOIS
Hypo	250 grams	100 lbs.
Sodium sulfite (desiccated)	10 grams	4 lbs.
Sodium bisulfite	25 grams	10 lbs.
Water to make	1 liter	50 gal.

The function of the bisulfite is to neutralize the sodium carbonate in the developer carried over by the films while the sodium sulfite serves to prevent possible sulfurization in hot weather. It is necessary to maintain the acidity of the bath either by allowing a continuous stream of sodium bisulfite solution to flow into the bath, or by adding a definite volume of a stock solution at intervals. The precise quantity to add depends on the alkalinity of the developer, the degree of rinsing between developing and fixing, and the quantity of film processed, but this can be determined easily by titrating a small quantity of the fixing bath with alkali at intervals to ascertain the loss in acidity.

An alternative method of maintaining the acidity is to pass sulfur dioxide gas into the fixing bath either continuously or intermittently through a perforated hard rubber tube leading to the bottom of the tank. There is little to choose between sulfur dioxide gas or a sodium bisulfite solution as regards efficiency but there is a danger of contaminating the darkroom atmosphere with the objectionable sulfur dioxide gas if an excess of gas is accidentally passed into the solution.

2. *Acid Hardening Fixing Baths*

An acid hardening fixing bath contains the following ingredients: (a) a silver halide solvent, (b) an anti-staining agent, (c) a preservative or sulfurization inhibi-

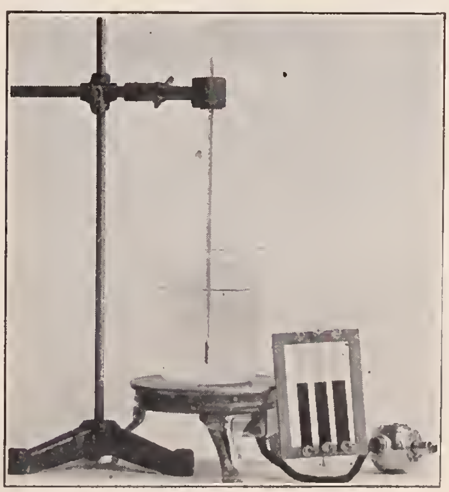


Fig. 1. *Apparatus for determining the melting point of the gelatin coating on motion picture film.*

tor, (d) a hardening agent.

(*a*) Although many solvents of silver halides are available, the most satisfactory for fixing purposes are sodium and ammonium thiosulfate. A solution of ammonium thiosulfate of a given concentration fixes more rapidly than a corresponding solution of sodium thiosulfate[5] but ammonium thiosulfate is more expensive and commercial grades are apt to contain free sulfur. For most purposes sodium thiosulfate fixes sufficiently rapidly and is entirely satisfactory.

(*b*) Practically any acid will function as an anti-staining agent because it has merely to neutralize the alkali in the developer carried over by the films and thereby retard oxidation of the developing agent. Organic acids such as citric, tartaric, oxalic, lactic, malic, maleic, and acetic, are more suitable than the inorganic acids because they are less dissociated and therefore have a correspondingly less tendency to precipitate sulfur from the hypo. Practically all of the sole organic acids yield with aluminium salts complex aluminium ions which are not effective hardening agents.[8] Acetic acid has been found to be the most generally efficient acid for use in fixing baths but much is still to be desired from the standpoint of a perfect acid for this purpose.

Of the acid salts, sodium bisulfite and potassium metabisulfite are the most generally used but they are not suitable for compounding a hardening fixture bath containing alum because the reserve acidity of these salts is not sufficient to prevent the precipitation of aluminium sulfite on the addition of alkali.

(*c*) It is imperative when compounding an acid fixing bath to have a quantity of free acid present in order to prevent discoloration of the bath by developer oxidation products and also to prevent the precipitation of the hardening agents by the alkali in the developer. This free acid tends to cause the precipitation of sulfur from the hypo especially at temperatures above 70° F. It is therefore necessary to add some substance which will prevent the precipitation of sulfur without impairing the anti-staining properties of the acid.

Two types of substances act in this manner. The first of these consists of the alkaline sulfites of which sodium sulfite is the most common. Since hypo decomposes in the presence of acid to form sodium sulfite and sulfur, it is considered that the addition of sulfite to an acid fixing bath retards the decomposition of the hypo because it tends to reverse the action by virtue of its mass action.

The second type of preservative consists of the alkali salts of organic acids which are commonly referred to as "buffer salts" and of which sodium acetate is a typical example. The effect of this type of substance is to buffer or reduce the hydrogen ion concentration of the acid employed below the limit at which sulfur is precipitated from hypo by acids.

(*d*) The hardening of gelatin may either be temporary or permanent. Temporary hardening agents raise the melting point and prevent the swelling of gelatin only while the gelatin is in contact with the hardening solution. A concentrated solution of sodium sulfate is a typical temporary hardener.[7] The hardening produced by such substances is reversible, that is, the gelatin will subsequently absorb water and swell. Such hardeners will not be discussed because their application is limited to tropical development when the temperature of the various photographic solutions is above 75° F.

Permanent hardening is characterized by a reduced absorption of water (swelling) by the gelatin during subsequent washing. Various materials may be used for permanently hardening gelatin such as formalin, quinone, tannin, organic developer oxidation products, and certain inorganic compounds. Formalin, quinone, and developer oxidation products harden gelatin only in alkaline or neutral solutions and their application is therefore limited to use in developers or to the hardening of completely washed film.

Of the inorganic compounds, the salts of iron, chromium and aluminium exert the most powerful hardening action on gelatin. Salts of aluminium are perhaps the most satisfactory hardener because they are colorless, readily soluble in water, and do not form colored compounds with the common developing agents either in acid or alkaline solutions, while they give satisfactory hardening provided the wash water is not above 75° to 80° F. Aluminium chloride tends to hydrolyze when dissolved in water, forming a white precipiate of aluminium hydroxide, but the double salts of aluminium sulfate with sodium or potassium sulfate called *alums* form a clear solution and are therefore to be preferred. Sodium and potassium alum are equally efficient but with ammonium alum an evolution of ammonia takes place after the fixing bath becomes alkaline and this tends to produce dichroic fog.[2]

III. *Standard Tests for Determining the Properties of Fixing Baths*

To date very few methods of representing the properties of a fixing bath in numerical terms have been published. The following tests, however, in no way give absolute measurements but they have proved satisfactory as a means of comparing the various formulas examined.

1. *Time of Fixation*

The time to clear Eastman negative motion picture panchromatic film when viewed against a black background was taken as a measure of the time of fixation. In order to maintain uniformity the film was immersed directly in the fixing bath and not previously developed in order to eliminate any error caused by swelling, which might influence the rate of diffusion of the hypo into the gelatin film and thereby affect the rate of fixation.

2. *Acidity*

One hundred cubic centimeter portions of the fixing bath were titrated with MQ_{25}* developer using phenolphthalein as an indicator. The results are expressed as the number of cubic centimeters of developer required to neutralize 100 c.c. of fixing bath.

3. *Sulfurization Life*

The time required for the average acid fixing bath to precipiate sulfur at ordinary temperatures (65° to 70° F.) is relatively long, so that in order to increase the rate of precipitation of sulfur and reduce the time required for the experiments, samples of the fixing bath were kept in glass-stoppered bottles at 110° to 115° F. and the time noted for the first visible turbidity. It was considered that a bath which was not stable under these conditions for one-half day was highly undesirable, whereas if the bath remained clear for three days at 110° to 115° F. it was found to remain clear for about one month at normal temperatures and therefore would be quite satisfactory for use at ordinary temperatures.

4. *Hardening*

The relative hardening produced by a given fixing bath was determined as the temperature at which the emulsion left the support after treatment in the following standard manner:

Strips of Eastman motion picture positive film ⅜ inch by 5 inches were exposed so as to produce three densities at one end of the strip, ranging from approximately 0.5 to 2.5 after development. These strips were developed in MQ_{25} diluted 1 : 1 for 2 minutes, rinsed 30 seconds, fixed 5 minutes in the fixing bath to be tested, and washed 15 minutes in running water. The temperature of the solutions up to this point was maintained between the limits of 65° to 70° F. The film was then placed on a wooden frame which was immersed in a beaker containing 750 c.c. of water at 70° F. The temperature of the water in the beaker was raised from 8° to 10° F. per minute and the temperature at which the gelatin emulsion left the support was taken as the melting point or a relative measure of the hardening produced by the fixing bath. The apparatus as used is illustrated in Fig. 1. The temperature at which the gelatin emulsion reticulated was not recorded after the first few experiments because it was found that this value is related to the melting point by a definite ratio. The degree of hardening produced depends on a large number of factors all of which must be maintained constant if consistent results are to be obtained. Some of these factors may be tabulated as follows:

1. *Nature of emulsion used.*
2. *Alkalinity of the developer and time of development.*
3. *Composition of rinse or stop bath.*
4. *Time in rinse or stop bath.*
5. *Concentration and relative composition of fixing bath.*

(*Continued on Page 19*)

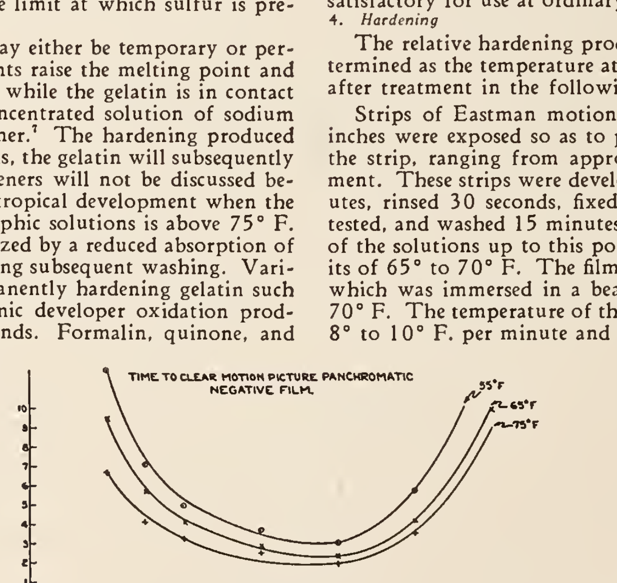


FIG. 2

Curves showing the time to clear Eastman motion picture positive and negative film in hypo solutions of various concentrations at different temperatures.

Note—(Formula of MQ_{25} Developer)

Elon	1.25 *grams*
Hydroquinone	3.75 *grams*
Sodium sulfite	75.00 *grams*
Sodium carbonate	25.00 *grams*
Potassium bromide	1.5 *grams*
Water to	1.0 *liter*

Borax Developer Characteristics

A Special Paper Prepared at the Laboratories of the Dupont-Pathe Film Manufacturing Corporation And Presented At Spring Meeting of S. M. P. E.

By H. W. Moyse and D. R. White

THIS study of borax developers was undertaken because their wide use emphasized the importance of detailed knowledge of their action. The results of the study not only permit the selection of a developer formula which seems very satisfactory, but also points out the sort of variations that will either increase or decrease the activity of the developer, to meet any special needs that may occur.

The tests were made with a number of negative materials in each development. Strips of film were exposed back of a sector wheel which gave a series of exposures varying on a time scale with factor two steps between successive areas of the strip. Strips were then developed for a number of lengths of time in the developer being tested. During this development the flat developing tray used was rocked systematically to give high, reproducible agitation which rapidly removed development products from the emulsion surfaces of the strips which were held flat at the bottom of the tray. The densities were read as diffuse densities and gave the density-time of exposure-time of development data used in comparing the developers.

To cover systematically the range of possible combinations of chemicals two series of tests were conducted. In each series one basic formula was being considered, and the test centered to some extent on that formula but in both series the variations covered a relatively wide range of concentrations. Many of these, of course, were such that they could hardly be of commercial value, but they all aided in showing the relationships among and the developing effects of the constituents. Table 1 gives the two basic formulas and also indicates the range of concentrations tested.

Table 1

Chemical	Series 1	Series 2	Range
Sodium Sulfite (Anhyd.)	100 g.	75 g.	1-200 g.
Borax	2	5	0-Saturation
Metol	2	2.5	0-10
Hydroquinone	5	0	0-20
Potassium Bromide	0	0	0-2.5
Water to	1 liter	1 liter	

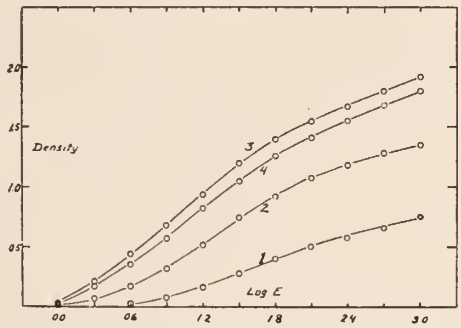


Fig. 1. Eight minute developments with: Sodium sulfite, varied; metol, 2 g/1. Hydroquinone, 5 g/1; borax 2 g/1. Emul. No. 1612.

Curve	Sulfite	Fog
1	1 (approx.)	.01
2	10	.06
3	50	.13
4	100	.14

Results

Sulfite

It was found that an increased rate of development accompanied increases in sulfite content up to a rather definite maximum, beyond which additional sulfite caused a falling off in high densities and in many cases a distinct loss in effective emulsion speed. Fig. 1 shows curves for one time of development in developers differing only in sulfite content.

The increasing development occasioned by increase of sulfite concentration from the initial low value is apparently due to the increased alkalinity produced by the larger quantities of sulfite. The alkalinity increases to a limiting value such that further sulfite additions leave it unchanged.

An increasing solvent action also accompanies increase of sulfite concentration. This solvent action has been known for many years and C. E. K. Mees and C. W. Piper (I) published data on the quantities of silver bromide necessary to saturate aqueous solution of sodium sulfite. Under developing conditions saturation may not be reached and the rapidity of solution may be affected by the other chemicals present. To test this solvent action in developers, test series were mixed differing only in sulfite content. Equal quantities of film were developed for equal times determined. Fig. 2 shows the change of silver content with increase of sulfite concentration. The slope of this curve is increasing rapidly, showing that a markedly greater effect of the solvent action is to be expected at the higher sulfite concentrations. The actual amount of silver observed in the developer was only a small proportion of the silver on the film, so small in fact that we hope to test more fully this solvent action to see if it really is a sufficient cause for the decrease of density observed.

The two effects just cited appear to be sufficient to account for the maximum development produced with increasing sulfite concentration. At low concentrations the increased alkalinity appears to be predominant while at high concentrations the solvent action seems more important. (*Continued on Page 23*)

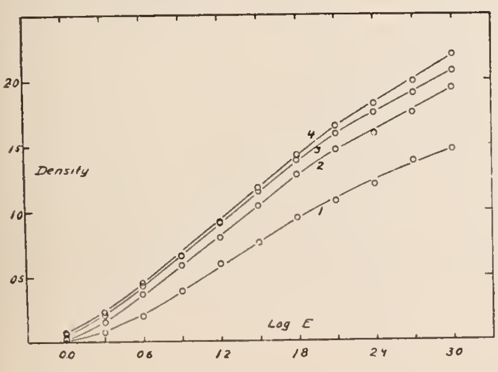


Fig. 3. Eight minute developments with: Sodium sulfite, 75 g/1; metol, 2.5 g/1; borax, varied. Emul. 2568.

Curve	Borax	pH	Fog
1	0	8.7	.03
2	2.5	8.7	.07
3	5	9.0	.07
4	10	9.1	.06

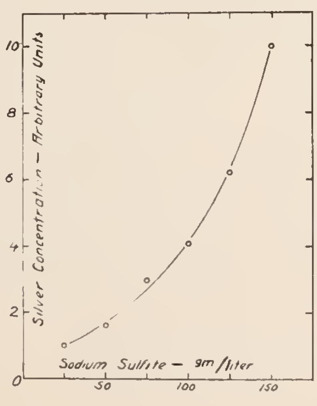


Fig. 2. Relative silver content of developers after eight minute agitated development with the equivalent of 32 ft. of film per liter. The developing formula was sodium sulfite, varied; metol, 2.5 g/1; borax, 5 g/1.

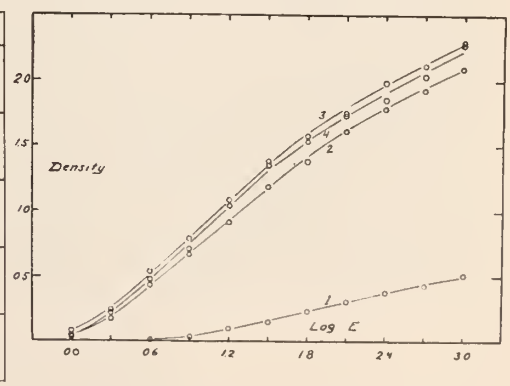


Fig. 4. Eight minute developments with: Sodium sulfite, 75 g/1; metol, varied; borax, 5 g/1; hydroquinone, varied. Emul. 2568.

Curve No.	Metol	Hydroquinone	Fog
1	0	20	.07
2	2.5	0	.07
3	2.5	5	.08
4	2.5	10	.10

See What Sound Did to Cameras!

ABOVE WE SEE *a few of the contrivances devised by cameramen to silence their cameras. Upper left is John Arnold, A. S. C., explaining his "Bungalow" to Director Lionel Barrymore. Upper Right is Paramount's "Baby Booth" on on location. Center is Fox camera, with its horse-blanket. Lower left is R.K.O. device called "Blimp." Lower right is Paramount "Baby Booth." Just under the upper right is Pathe's device.*

SOLVING THE "ICE-BOX" PROBLEM

Cinematographers Show Remarkable Ingenuity in Various Devices They Have Worked Out to Bring the Cameras Out of Sound Booths.

By WILLIAM STULL, A. S. C.

EVER SINCE the first Vitaphone experiments, one of the chief technical problems has been the reduction of camera noise. Even the best of pre-talkie cameras were too noisy for sound work, and though they were completely remodeled, and every possible source of noise muffled, they were still loud enough to seriously interfere with the microphone. Obviously, the only solution of the problem was to isolate them from the microphones, and E. B. DuPar, A. S. C., who photographed the first Vitaphone subjects, found himself confronted with the problem of doing this at the very start of his work.

The result was the camera booth, a small, portable, soundproof room into which camera and cameraman were locked while working. The scene was photographed through a large window of optically plane glass at the front of the booth, while entrance was through a door at the rear. The matter of ventilation was quite overlooked in the first booths, and not greatly improved even in the later ones. But these later booths, however, as sound production became general, evolved into comparatively palatial affairs. The current models are much larger than their predecessors, and usually hold two cameras, which are mounted on an adjustable shelf rather than on tripods. The ventilation is much better, and is often aided by small electric fans, air-hoses, and so on, while communication with the outside world is maintained through a telephone.

None the less, camera booths of any sort are highly unpopular with cinematographers. This is not only because they are at best uncomfortable things to work in, but because they seriously restrict and harm the quality of the camera work. Naturally, the size of the booth completely eliminates any possible mobility, as well as restricting their placement for angle-shots. Also, the glass through which the scenes are photographed acts as a diffuser, and gives "talkie" photography its objectionable "mushy" quality. Cameramen don't particularly mind enduring necessary personal discomforts, but when the quality of their work is jeopardized, they rise in unanimous protest. In this case their protest has taken tangible form, and given concrete evidence of the ingenuity and persistence of the industry's technicians. Practically every technical staff in Hollywood has attacked the problem of doing away with the booth. The actual devices resulting from this work are different in each studio, but they are all recognizable as springing from the same urge, and toward a common goal. In every case the same principal aims have been in the designers' minds:

1. To do away with the booth.
2. To restore the camera's mobility.
3. To eliminate the glass window.

Probably the earliest of these devices, and one of the most successful, is the "Bungalow" invented by John Arnold, A. S. C., and in general use at the Metro-Goldwyn-Mayer studio. Reduced to its lowest terms, the "Bungalow" is a small, soundproof enclosure built around a Mitchell High-speed camera, and mounted on a steel tubular tripod which rolls on rubber-tired wheels. It is made of sheet lead over an iron frame, and lined inside with sound-deadening sponge-rubber. Large doors on either side and behind give easy access to the various controls of the camera, while in front, the window is replaced by a removable plate faced with sponge-rubber, which fits tightly around the lens, damping any noise that might come out that way. The matte-box is placed on the outside of the bungalow, as is the finder. while the driving motor, being a separate unit in the Western Electric system, has its own little bungalow and tripod, and is connected with the camera bv a heavy, flexible-cable drive. For ease of manufacture, the outfit is startlingly angular, and looks decidedly like some cubist's concept of a camera, but it is none the less an essentially practical device, made by an intensely practical man, for practical use.

When asked about his invention, Mr. Arnold's reply was characteristically modest. "Well," he said, "I saw that something had to be done to get us out of those infernal booths, so I just keept at it until I got something I knew would work."

How well it works is evidenced by the fact that the studio uses the "Bungalow" for all purposes, to the almost complete exclusion of booths. Furthermore, the improvement in photography since their adoption is even more conclusive evidence of its success.

Walter Lundin, A. S. C., the chief cinematographer for Harold Lloyd, has modified the "bungalow" to meet his special requirements, and is using it with complete success on Lloyd's current picture.

At the RKO studios, Don Jahraus, the head of the miniature department, has evolved an equally successful device, though one of an entirely different aspect. His "Blimp Camera" is simply a covering for the camera, and fits on any standard tripod. It is made of a frame of Yucca, lined with sponge-rubber, and covered with rubber sheathing. Due to the pliability of its materials the shape of the "Blimp" approximates that of the camera, while its lightness—only 30 lbs.—makes it the lightest camera cover in general use. The lens, as in the Arnold "Bungalow," is muffled in sponge-rubber, eliminating the undesirable window. The finder is also outside the "Blimp," but the motor is kept inside, as that studio uses the Photophone system.

E. B. DuPar, A. S. C., in camera booth used in filming the First Vitaphone picture.

As a unit, the "Blimp" is undoubtedly the lightest and most mobile in general use today. It has lately been modified for use with the Western Electric system by George Barnes and Gregg Toland of the Samuel Goldwyn Co.'s camera staff. As that company still uses booths for much of the interior work, the glass window is retained in the "Blimp" to preserve a matched photographic quality throughout. They have also considerably enlarged the device, giving more convenient working-space within.

As in the original "Blimps," access to the camera is by a large door at the back, while the left side is completely removable for loading, etc. The finder is enclosed in the body of the "Blimp" and an ample window

(Continued on Page 36)

JUNGLE

By

A. Kinney Griffith

Illustrated by John Corydon Hill

JAVA-HEAD—the fierce tropical sun beat down on the virgin jungle—a tangle of giant banyans, camphor, and ebony trees, interlined with chonta, nibung, areca and nipa palms, with an undergrowth of sapang, rattan, bamboo, and a matting of beautiful orchids growing wild and in a gorgeous array of colors. The heart of equatorial jungle, it was a primitive land where nature ran riot, where the struggle for existence was eternal, inevitable, deadly.

From a narrow trail, leading from Paga-Junstan to the shoreline, emerged a Javanese coolie and a girl. On the coolie's face was the look of a hunted man. On the girl's face was an expression of fear.

The coolie, a huge, powerful, gorilla-like man, wore only a short red sarong and carried a small canvass bag in his right hand. A long kris and several parang spears hung from his massive shoulders. He held the girl's hand in his left and jerked her to him, as he gazed quickly toward the trail they had left behind.

The girl, nude except for tightly fitting breech-clout and rattan sandals, was young, lithe, slender and beautiful after the fashion of the south sea islander who boasts of white-blood heritage.

For a moment they stood motionless, listening to sounds coming from the jungle trail. Then the giant gorilla-like coolie gave the girl another jerk, dragging her forward at a brisk run up the beach to where a high coral reef extended from the surf to a sharp cliff partly hidden by jungle foliage. Soon they entered the jungle near the cliff-side and disappeared from view.

Several minutes later another man emerged from the trail and stopped short on the beach. This man unmistakably was white. It was Trelawney Douglass. Dressed in a white pongee suit and pith helmet, he was typical of the young American adventurer who is often found in the far-away places of the earth. He carried a high-powered rifle and from his belt hung a short Malay kris. His face and hands were sunburnt to the hue of old leather. His blue eyes, as he gazed at the footmarks left by the former two, had an ominous glitter in them.

Without pausing any longer, he turned and ran up the beach on the trail of the coolie and the girl. He too turned at the cliff-side and disappeared from view.

The American plunged into the jungle and found a faint trail leading along the base of the cliff. For a time he followed this trail at a brisk walk, ever watchful for footprints of the two people who had passed before him, and alert for the venomous reptiles and ferocious beasts that infested the Java jungle.

AFTER two hours the trail began to mount toward a far-off tableland that formed the backbone of the island. Coming to a tall chonta palm beside the trail, Douglass dropped his weapons and quickly climbed the palm to its top. There, a hundred feet above the humidity of the dense jungle, he drew a deep breath and let his gaze wander over the jungle top.

In the distance, possibly two miles away, he beheld two tiny figures hurrying along the trail which lead toward the tableland. His lips moved in a silent curse; he knew what it meant when he saw those moving figures on the inland trail. He knew the instinct of the giant coolie, a Samarangan—son of the Samarangan head-hunters—now making the trek toward his jungle home-land.

Again Trel's lips moved, then set in a grim line as he slid back down the long bole of the palm tree. Picking up rifle and kris, he struck out in a steady run on the trail of the girl and the coolie. Another hour passed as Trel plunged on. The scorching sun shone down. Heat waves danced and mirages appeared before his burning eyes.

Suddenly the sound of a human voice came to him from the trail ahead. Instantly he stopped in his tracks and his rifle came up, alert. Seeing nothing, he advanced cautiously. The human sound became more distinct, then he identified it as the voice of someone pleading for mercy or help. Then the pleading voice changed to one of pain, a note of distress. It was the girl's voice.

It spurred the American to reckless fury. Like a wild man he broke into a full run and plunged through the jungle trail. The force of his body swishing against the foliage, the snap of his steps in the trail made much noise, but he did not care. The only thing that mattered was that he now saw the end of his quest. The end. Here in the jungle wilderness, instead of in the Samarangan hinterlands where his blond head would make a prized possession for some dusky chief to flaunt before his harem.

TREL DOUGLASS burst from the trail unto a tiny clearing around a wild-beast watering hole. There was nobody in sight as he stopped short. There was not a sound anywhere in all the jungle. Mystified, he looked all around him, and then came the swish of a hastily flung spear.

Trel dodged instinctively and the murderous weapon passed overhead, missing him by inches. Before any more spears could be thrown, he sprang forward, desperately. Behind an ebony tree, he found where the spearman had stood; but now, only the inscrutible silence of the jungle greeted him. The rustle of a leaf, then he whirled quickly—again in time to avoid another parang spear. This one came from the right and was followed instantly by a diabolical roar and the mad plunge of the huge Javanese coolie brandishing a glittering kris.

The American barely had time to whirl and fire one snapshot from his rifle. Instantly he knew that the shot had missed its mark. Then the writhing fury of the Javanese was upon him, knocking the rifle away with one terrific sweep of his huge hairy arms.

Avoiding the kris, Trel lashed about in desperation, driving his fists about like rapiers, but his defense was weak—almost useless against the enormous strength of the coolie. He managed to batter the small cannibalistic eyes of the native until he drew grunts of pained fury, but he could not weaken the coolie's strength nor keep away from his terrific lunges.

The coolie dropped his kris and wrapped his arms around the white man's waist. Both toppled to the ground. As he struggled vainly to break the giant's hold, Trel saw the girl drag herself toward the melee and pick up the long kris. Nearer she crept, as the men fought and thrashed upon the ground. Then the girl straightened up and aimed the kris for the broad back of the coolie.

There came the roar of a fiend incarnate as the giant gave one more jerk at the white man's back. Then Trel felt himself falling into a black pit that seemed full of shooting stars.

A BESTIAL scream and a diabolically harsh yell snapped Trel back to consciousness. The savage yell was followed by a bellowing roar, more screams followed, screeches, more piercing and fearful than the first.

Pain shot through his battered back as he sat up and looked into the jungle toward the sounds. In great agony he struggled upright, bending his back several times to work out some of the soreness. Barely able to walk, he staggered off in the direction of the yells that were becoming horribly appealing.

A dozen steps and he broke into a stumbling run. Pain retarded his movements and the jungle was so dense he could not see more than ten feet ahead. This genuine fright caused him to stop in his tracks, struck with astonishment. A gruesome scene was being enacted before his eyes and momentarily holding him spellbound. The coolie and the girl were directly ahead—the girl lying face down on the ground, the coolie wrestling in the embrace of a monster black-maned Bengal tiger!

Both man and tiger were thrashing around with frightful ferocity, the tiger snarling viciously, the coolie emiting agonized yells with blood-curdling rapidity.

Trel was watching that giant gorilla-like man as if something had hypnotized him. The mighty muscles on the coolie's hairy back and legs were bulging as if about to burst. One instant the coolie was atop of the tiger, next instant the beast was on top, clawing and snapping at the coolie's throat.

Man and beast changed positions with lightning quickness. Blood flowed freely. The savage snarls became more hideous as the tiger scored with teeth or claw, and the coolie retaliated with a swift stab of his kris.

Trel, his rifle lost in the former scuffle, drew his short kris and jumped in close to the combat to get a blow at the tiger. He missed his aim and had to jump away to avoid slashing the coolie. Just then the tiger dealt the coolie a stunning blow that sent him spinning to the earth. The Bengal sprang with a clear way to the coolie's juglar vein. Blindly he struck out to defend himself, but his strength was waning.

Trel rushed forward and swung the kris in a wide arc. *Zoom*, came the kris, and *whack* through the tiger's neck near the base of the head. It was a powerful blow, nearly severing the beast's head from its body. Blood gushed out and down into the coolie's eyes and face. The tiger lunged in the death throes and with its powerful claws ripped the coolie from head to groin. There came a groan from the Javanese that sounded like paleolithic anguish, then again all was still in the jungle. The Javanese laid on his back and his chest worked up and down forcing respiration in gigantic drafts. A full minute he lay thus, while Trel rushed over and

(*Continued on Page 46*)

"Trel, Sahib," said the Coolie, "Me damn fool."

As the Editor Sees It

Hoof and Mouth Disease

ONE of the most delightful evenings this writer has experienced in years was the night he went to Warner Brothers' Theatre in Hollywood to see and hear Al Jolson in "The Singing Fool."

Unashamed, the writer wept with the other hundreds as the inimitable Jolson, the comedian, rose to the heights of tragedy. The cross-section of the life of a singing waiter who rose to fame was interesting, intriguing and novel. In other words, Warners had given the public something different; and, with Vitaphone, had enabled the vast public to hear the singing of Jolson.

Then came the sheep!

The public had received a singing picture with open arms—and purses. So the great producing minds decided that there should be more singing pictures. Pictures showing life behind the scenes. The hearts of the chorus girls must be bared, along with their legs, so often ill-shaped and bowed.

Some were excellent, some were good, some were bad and others should have died a-borning.

Girls! girls! girls! Dressing rooms! Half-clad girls! Spiral stairways down and up which crowds of girls scamper with lead in their aching hearts—apparently also in their aching feet! Footlights before which you see a long line of under or over-nourished calves! Long lines of girls in short dresses doing dances apparently limited to the few steps the stars can do! Squeaky voices laboring like a suffering woman to reach notes never meant for them!

What a relief to sit in a theatre and see and hear a picture like "Dynamite."

The writer hesitates when someone suggests a picture show, because he fears he will see another "hoof and mouth" affair. Even another court trial would be better, although it does seem a shame to turn our theatres into courthouses. However, even that is better than trying to turn them into fourth-rate musical comedy halls. We have had sufficient musical comedies for a while.

Some companies are planning glorified "Westerns" in talkies. May they be blessed forevermore! Give us the great open spaces of the wild and woolly West any day in place of the countless lines of open mouths and apparently weary feet of ambitious extra girls who overnight try to look like New York show girls.

Service

REALIZING that there is a crying need for a remedy for the present chaotic aperture variation that is adversely affecting theatres in the United States, members of the great body of technicians have again come to the front in an effort to do something that will be of material benefit to the motion picture industry.

The American Society of Cinematographers, the Technicians' Branch of the Academy of Motion Picture Arts and Sciences, and the Pacific Coast branches of the Society of Motion Picture Engineers and the American Projection Society are the organizations fostering this move. A committee has been appointed, composed of members of these organizations; and they are undertaking the investigation and comparison to draw up a set of standards for camera and projector apertures which it is hoped will do away with the present condition.

This is a very commendable step on the part of these technical bodies, and is typical of the spirit that is found among this great group of men. Always, when the industry faces a technical crisis these men can be depended upon to step into the breach and save the day. They do it solely in a spirit of honest helpfulness and interest in the welfare of the industry. They do it "on their own time," after they have worked their required number of hours at the studios.

When talkies presented the problem of incandescent lighting it was the American Society of Cinematographers and the Academy that came forward and by their experiments advanced the talkies by proving the worth of incandescent lights.

And now when a crisis in the aperture situation arises and we see the tops of scenes clipped off in the theatres, these men are again solving the problem.

This is real service. Let us hope that the "powers" of the picture industry will some day realize the worth of these men; will appreciate the fact that they are the life-blood of the industry and will give them the material reward that should be given for service.

Scenario Writing for Amateurs

ONCE in a blue moon an inspired soul sits down at a typewriter and produces a piece of work that means something more than a collection of words. Not often, 'tis true.

Since the advent of the 16 mm. camera for use of amateurs, the world and his wife have been writing this and that with the hope, apparently, that the amateurs would pour out the American dollars for same. There have been some good volumes printed, it is true; volumes that are of material assistance to the home movie maker.

And now comes another book. It is "Scenario Writing and Producing for the Amateur," by Marion Norris Gleason, published by the American Photographic Publishing Co., of Boston.

A careful perusal of this volume leads the writer to give it the stamp of approval and say that the writer of this book has given the amateur something that should be really not only interesting but decidedly helpful. Written in clear and simple English, the writer contributed something that is instructive, and it should be of great influence in amateur circles.

Pictures in College

THE University of Southern California is to be congratulated upon its decision to emphasize the importance of the motion picture. When the Fall term opens, a new course will start in "Social Aspects of the Motion Picture."

There will be laboratory work and lectures. The "labs" will be motion picture studios in Hollywood. Profesor B. V. Morkovin will head the new course. He has been doing research on the subject for the past three years. An interesting angle which he has been studying is methods of detecting scientifically the kind of motion pictures that makes the greatest "hit" with the greatest number of people at a certain period, from both an artistic and social standpoint. We imagine many a studio ear will be glued close to this course.

The University of Southern California last year took a forward step in instituting courses dealing with motion pictures; and is one of the first universities to give the cinema serious consideration. Progressive heads are leading this university along its path, and show common sense by realizing that motion pictures are a big factor in life of today.

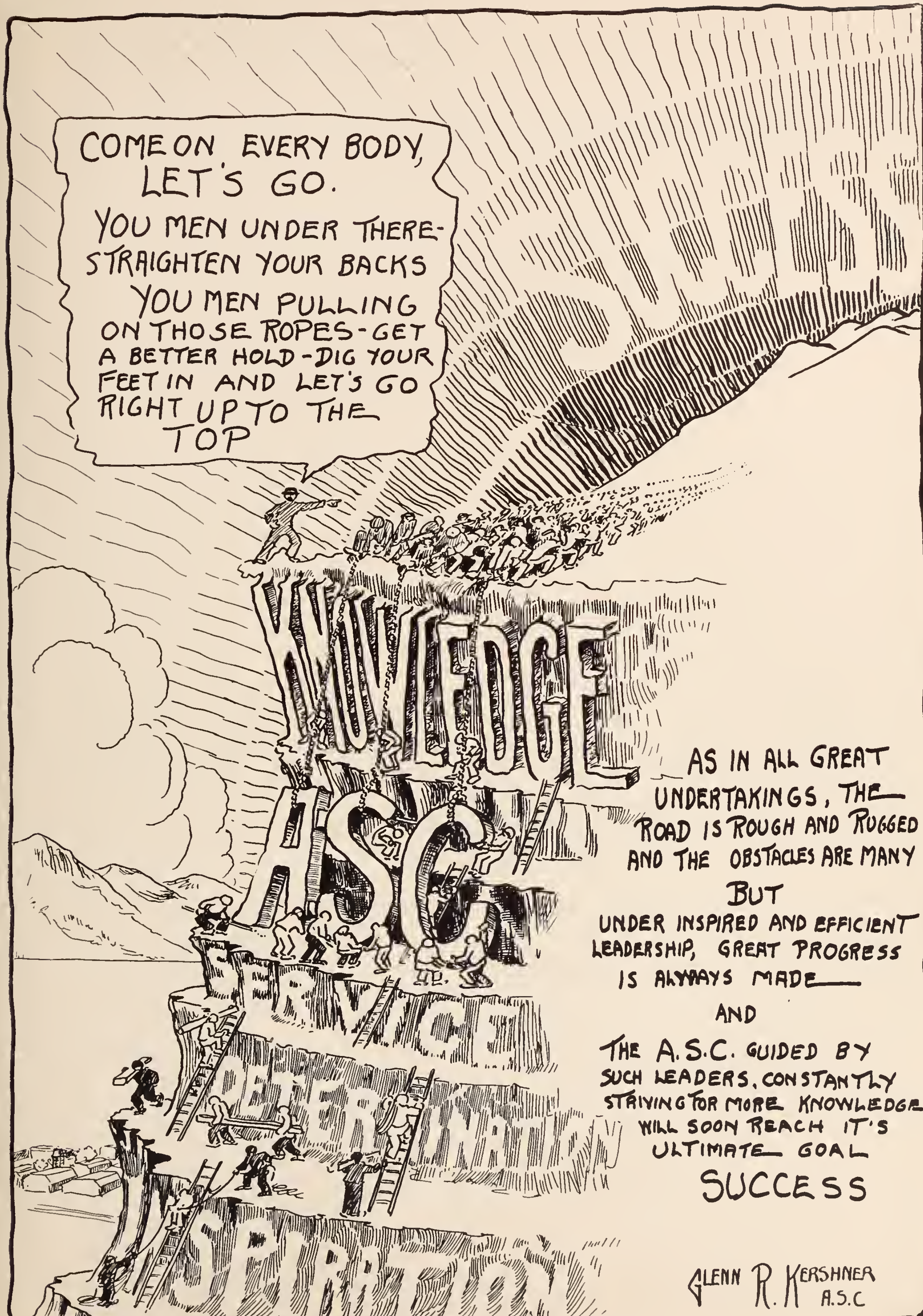
Thank You!

ONE of our readers sent us an interesting letter recently in which he congratulated us upon our decision to give the amateur Cinematographer an important niche in our scheme of things in this magazine.

"You show real vision," declared this reader, "in emphasizing the amateur department. Surely no organization in the world can do more for the amateur than you of the A.S.C. We amateurs appreciate what you are doing, and we appreciate the opportunity to keep in touch with the professional.

"Without doubt, the amateurs will contribute something really great in cinematography some day in the future. But they need the teaching and aid of the professionals as they start to creep along cinematographic paths. I, for one, realize the great benefit your magazine is to us."

Words such as those are inspiring to those of us who are really trying to be of service. The general rule, however, is to receive only adverse criticism. It seems strange, but is true, that most people think there is but one kind of a comment. When we do receive a kind word it warms the heart and makes us glad we are an editor. To say we are thankful is putting it mildly.


COME ON EVERY BODY, LET'S GO.
YOU MEN UNDER THERE- STRAIGHTEN YOUR BACKS
YOU MEN PULLING ON THOSE ROPES-GET A BETTER HOLD-DIG YOUR FEET IN AND LET'S GO RIGHT UP TO THE TOP
KNOWLEDGE
A.S.C.
SERVICE
DETERMINATION
INSPIRATION
AS IN ALL GREAT UNDERTAKINGS, THE ROAD IS ROUGH AND RUGGED AND THE OBSTACLES ARE MANY
BUT
UNDER INSPIRED AND EFFICIENT LEADERSHIP, GREAT PROGRESS IS ALWAYS MADE
AND
THE A.S.C. GUIDED BY SUCH LEADERS, CONSTANTLY STRIVING FOR MORE KNOWLEDGE WILL SOON REACH IT'S ULTIMATE GOAL
SUCCESS
GLENN R. KERSHNER A.S.C

Some Properties of Fine-Grain Motion Picture Film Developers

Part Three of a Paper Presented at the Spring Meeting of the Society of Motion Picture Engineers at New York City, May 6 to 9, 1929

By H. L. Carlton *and* J. I. Crabtree

This is the final installment of Communication No. 388 from the Kodak Research Laboratories, Rochester, N. Y. The first part appeared in the July issue of the American Cinematographer. The second appeared last month. If any reader missed the other installments he may secure the back numbers through this office.—Editor's Note.

Several investigators have studied the fine grain producing properties of the Eastman borax developer. Its ability to produce fine-grained images is undoubtedly a result of the presence of a high content of sodium sulfite which exerts a solvent action on the silver halide grains, reducing their size and preventing clumping.[15] Namias[16] concludes that the rate of development is too low for practical purposes and claims that his recommended developer (formula 13, Table VI) gives equally fine-grained images with an increase in rate of development. Lumière and Seyewetz[17] found that the images produced by the borax developer are finer-grained than those produced by the same developing constituents used with carbonate as the alkali. Veldman[18] concluded that the borax developer gave very fine-grained images but no finer than the following developer: Elon 15 grams; sodium sulfite (anhydrous) 150 grams; potassium bromide 2 grams; water to 1 liter. This developer is impractical because of the loss in emulsion speed caused by the high bromide content. He varied the sulfite content from 0.5 to 320 grams per liter and found that the graininess decreased as the sulfite content increased. Lüppo-Cramer[19] found that with the Eastman borax developer fine-grained images were not obtained with all silver bromide emulsions. Emmermann[20] in a series of tests on motion picture film found that the Eastman borax developer was the best formula known for producing fine-grained images. Hauck[20] concludes that the low alkalinity of the borax developer contributes indirectly to the production of fine-grained images because the relatively low rate of development permits the sulfite to exert more solvent action which progresses with time. Although the normal borax developer formula gives satisfactory fine-grained images, experiments were made to determine the possibility of securing even finer-grained images and to study the effect, on graininess, of varying the composition of the developer and the time of development.

(A) *Method of Measuring Graininess*

An 8½ x11-inch sheet of Kodaloid was divided into nine equal rectangular areas. A step tablet was made by covering the areas with pieces of neutral gray gelatin having densities ranging in steps of 0.3 from that obtained with film base (0.02) up to 2.4 inclusive. This tablet was then mounted on the easel of a title camera and illuminated from behind with the light from two 1000-watt lamps diffused with ground glass. A length of film was exposed in the camera and then used as a standard for testing the graininess produced by the experimental developers. With normal development this negative gave nine uniform areas per frame with densities ranging from 0.15 to 1.4.

Half-gallon glass battery jars were used for holding the experimental developers and four jars were handled as a unit in a constant temperature water bath. A miniature wooden rack was used holding fifty inches of standard film. To test a series of developers, one rack of the standard negative was developed to the same gamma in each of the trial developers. Each of the 50-inch negatives was spliced into a loop and a 30-foot print made from each for projection. The prints were all given the same time of development.

(B) *Experimental Results*

A series of experimental developers was compounded in which the concentration of each of the constituents was varied over a wide range. Each was compared with the standard borax formula. The conclusions indicated in Table VI were drawn from the prints projected under normal projection conditions.

(C) *Discussion of Data*

The following general conclusions have been drawn from a long series of graininess tests on trial developers.

(1) For a constant degree of development the graininess decreases as the sulfite content of the developer increases from 25 to 200 grams per liter. In the range between 25 and 100 grams of sulfite per liter there is a marked decrease in graininess and a slight definite improvement occurs in the range from 100 to 200 grams per liter.

(2) If the sulfite content of the developer is maintained constant and the concentration of one of the other constituents is varied so as to alter the rate of development, the graininess for a constant degree of development decreases as the rate of development decreases. For example, if the quantity of developing agents and borax is halved so that the rate of development is decreased, the graininess decreases because, in order to secure negatives having a given contrast, development must be prolonged during which time the sulfite can exert a greater solvent action and therefore reduce the graininess.

The total solvent action of a developer on the emulsion can be increased in two ways, as follows:

(*a*) By increasing the sodium sulfite content;

(*b*) By decreasing the rate of development so that the negative is in contact with the developer for a longer time and the sodium sulfite present has more time to exert a solvent action.

The solvent action, however, cannot be carried to the extreme without detracting from some of the other good qualities of the developer. A very high concentration of sodium sulfite causes an excessive quantity of silver halide to be dissolved and this is accompanied by increased sludge formation. A badly sludged developer is objectionable because it leaves a residue on the negative which is not readily removed in the wash water and is very difficult to remove in the drying room. Moreover, the formation of sludge is a development process and not only depletes the supply of developing agents, but builds up the reaction products of the developer which inhibit the process of development. Therefore, as the solvent action of a developer is increased its useful life decreases because a large percentage of the developer is wasted in the formation of sludge.

Hypo is also a solvent for the silver halides and has been used successfully in some developer formulas containing caustic al-

Table VI

Variations in Graininess Produced by Varying the Components of the Borax Developer

No.	Elon	Hydro-quin-one	Sodium Sulfite	Borax	Boric Acid	Sodium Sulfate	Time of Development	Graininess
1	2	5	100	2	(Standard Developer)		10½ min.	Average
2	2	5	100	2	14		19 "	Very good
3	2	5	100	8	8		9½ "	Average
4	2	5	100	14	2		7 "	Poor
5	2	5	25	2			8 "	Very poor
6	2	5	50	2			8 "	Poor
7	2	5	150	2			12 "	Very good
8	2	5	200	2			15 "	Very good
9	2	0	100	2			12 "	Average
10	0	10	100	20			16 "	Average
					Sodium Carbonate			
11	1	25	50	1			15 "	Poor
12	1	25	100	1			15 "	Very good
13*	5	0	50		5		5 "	Poor
14	2	5	100	2		100	15 "	Good
15	2	5	50	2		100	15 "	Average
16	2	5	25	2		100	15 "	Poor
					Hypo			
17	2	5	25	2	0.5		13 "	Poor
18	2	5	25	2	1.0		11 "	Good
19	2	5	25	2	2.0		19 "	Good
20	2	5	25	2	4.0		28½ "	Average

*Namias developer used with 5 c.c. of phenosafranine 1:1000 per liter.

kalis. The last four tests recorded in Table VI were made to ascertain if small quantities of hypo could be used in the same way that relatively large amounts of sodium sulfite are used to produce fine-grained images. Just enough sodium sulfite was used in a developer formula to act as a preservative for the developing agents.

Hypo is a very active silver halide solvent and the concentration that can be used is critical. One gram per liter was sufficient to produce very fine-grained images. The higher concentrations, although giving satisfactory graininess, dissolved so much of the silver halide that they appreciably decreased the speed of the emulsion.

Theoretically, the hypo which combines with the silver halide to form the soluble silver halide hypo complex salt should be regenerated when the combined silver is reduced so that the concentration of the hypo should remain constant as the developer is used. The advisability of the use of hypo in this type of developer, however, is questionable.

(3) If the concentration of the developer is kept constant, the graininess decreases with the degree of development. A series of test exposures was developed at two-minute intervals from six to twenty-four minutes. To test the relative graininess of these negatives the positive development times were varied so as to make matched prints from the high and low gamma negatives. The prints were developed in the motion picture positive developer (Formula D-16) with the following results:

TABLE VII

Negative Development Minutes	*Gamma of Negative*	*Positive Development Minutes*	*Virtual Gamma of Print*
6	0.39	8.5	0.70
16	.80	3.5	.80
8	.46	8.5	.78
18	.86	3.5	.78
10	.54	8.5	.96
24	.98	3.5	.88

As shown in the table, the prints were matched for six and sixteen, eight and eighteen, and ten and twenty-four minute negatives to give practically the same virtual gammas (product of gammas of positive and negative). For each pair of negative development times the higher degree of development gave more graininess than the lower one.

The above tests indicate therefore that the graininess of prints made at a constant virtual gamma is not constant but increase with the degree of development of the negative. From this it must be concluded that increasing the degree of development of the negative increases the graininess far more than increasing the degree of development of the print. In other words, the graininess-gamma curve for the negative material over the useful range of gammas (0.5 to 1.0) appears to be straight and rather steep, while the graininess-gamma curve for the positive (gammas of 1.2 to 2.2) has a long shoulder which must be almost parallel to the gamma axis. Further work is in progress in this connection.

(D) *Practical Applications*

The proportion of sodium sulfite in the published formula for the borax developer is very satisfactory for the rack and tank method of development where the same developing solution is used over a period of two or three weeks. It gives the minimum graininess that can be obtained with the quantity of sludge that can be tolerated with this type of developer.

In the case of commercial film laboratories where several tanks of developer are exhausted in one night, different conditions prevail since with the normal developer more than five hours are required for the sludge formation to take place. If the developer is exhausted quickly it is possible to use a higher concentration of sulfite and obtain finer-grained images throughout the life of a developer.

Use of the Borax Developer with Motion Picture Positive Film

Extensive tests have indicated that the graininess of images produced by the borax developer is not appreciably less than that of images obtained with the formula D-16 recommended for the development of Eastman motion picture positive film. In many cases, however, the borax developer is to be preferred for the following reasons:

(*a*) It may be used with safety for developing positive film on a reel because the high concentration of sodium sulfite prevents the formation of aerial fog.[8]

(*b*) The rate of development of positive film with the borax developer is relatively slow so that it is to be preferred when a low degree of development is required. From Table VIII it is seen that a maximum practical gamma of 1.7 is obtained with Eastman positive film in 23 minutes at 70° F. as compared with a maximum gamma of 1.93 obtained in 11 minutes at 65° F. with Formula D-16.

TABLE VIII

Time-Gamma Measurements for Positive Film Developed in the Borax and D-16 Developers by the Rack and Tank Method at 70° F.

BORAX DEVELOPER		D-16 (ELON-HYDROQUINONE)	
Time	*Gamma*	*Time*	*Gamma*
11 min.	1.25	3 min.	1.0
14 min.	1.45	5 min.	1.45
17 min.	1.62	7 min.	1.72
20 min.	1.68	9 min.	1.90
23 min	1.72	11 min.	1.93
26 min.	1.72	13 min.	1.95

For any given developer formula the rate of development and maximum gamma depend on the temperature of development, the nature of the emulsion used, the degree of exhaustion of the developer, and the degree of agitation of the film, so that with machine development the above maximum gammas would be somewhat higher. The rate of development may also be modified in the same manner as outlined on page 7.

Prolonged development in the borax developer beyond twenty minutes at 70° F. is not advisable owing to the fact that the fine-grained positive emulsion is appreciably soluble in concentrated solutions of sodium sulfite. Unexposed positive film will fix out completely in from 60 to 90 minutes at 70° F. in the borax developer, although some dichroic fog is simultaneously formed.[7]

The life of the developer with use is somewhat shorter than for negative development owing to the greater solubility of the fine-grained positive emulsion which therefore causes greater sludge formation and a relatively more rapid exhaustion of the developer. It may, however, be revived in the same manner as when used for motion picture negative film.

V. *Summary and Practical Recommendations*

(A) For the rack and tank method of development when one tank of developer is used over a period of two or three weeks the following formula as previously published[1] is very satisfactory:

	METRIC	AVOIRDUPOIS
Elon	2 *grams*	2 *lbs.*
Hydroquinone	5 *grams*	5 *lbs.*
Sodium sulfite (anhydrous)	100 *grams*	100 *lbs.*
Borax	2 *grams*	2 *lbs.*
Water to	1 *liter*	120 *gal.*

About 80 feet of negative motion picture panchromatic film can be processed per gallon before the developer needs revival. During this time the fog or veil will decrease considerably, the speed of the emulsion will drop to about 60 per cent of its value in the fresh developer, and the time of development for a given contrast will increase from 20 per cent to 30 per cent.

After 80 feet of film have been processed per gallon, the developer can be revived with half the original quantities of Elon, hydroquinone, and borax dissolved in hot water with enough sodium sulfite to make its concentration in the reviving solution equal to 10 per cent. For the revival of a 120-gallon tank of developer one pound of sulfite and then one pound of Elon are dissolved in two gallons of hot water, one pound of sulfite and two and a half pounds of hydroquinone in two gallons of hot water, and three pounds of sulfite and one pound of borax in two gallons of hot water. These three solutions are added to the developer tank and mixed thoroughly.

An additional 80 feet of motion picture film per gallon can then be processed in the revived developer without any serious drop in the speed of emulsion. Further use of the developer may give a serious drop in the speed of the emulsion.

(B) The graininess of images produced by the borax developer can be improved in three ways:

1. If the rate of development is held constant, the graininess for a constant degree of development can be improved by increasing the concentration of sodium sulfite to give increased solvent action.

In processing laboratories where a developer is used continually for one night and then discarded, the sulfite content can be increased to 150 grams per liter. This developer is recommended only in cases where it can be exhausted rapidly and thrown away before it has time to sludge excessively.

2. If the sulfite content of the developer is held constant, the graininess for a constant degree of development can be improved by decreasing the rate of development. This is done by decreasing the alkalinity of the developer or reducing the concentration of the developing agents.

3. The graininess of an image on negative motion picture film developed in the borax developer increases as the degree of development (gamma) of the image increases. In the case of positive motion picture film, however, graininess appears to increase as the degree of development increases up to a certain point and then increases only slightly, if at all. From the standpoint of graininess, therefore, for a given virtual gamma of the positive (product of negative and positive gammas) it is preferable to develop the nega-

(*Continued on Page 41*)

Electro-Magnetic Recording of Acoustic Phenomena

Noted German Scientist Discusses Recording and Reproduction of Sound on Steel Wire or Ribbon

[This is an abridged free translation from a report of Dr. Curt Stille, printed in the excellent German magazine, "The Filmtechnik," No. 9, pages 191 to 194. It is presented here because of the unusually interesting subject matter.—Editor's Note.]

A LENGTHY introduction to the report explains as to how it sometimes takes years and even decades of constant developing before an idea has reached a state of completion which may be called perfect.

The idea being discussed relates to the solution of the problems inherent to the recording and reproduction of sounds through electro-magnetic influences on a steel wire or ribbon.

Dr. Paulsen, a Danish scientist, thirty years ago conceived this system, and the author, himself, started his investigations some twenty-six years ago.

It is well known that a piece of steel, say a knitting needle or a steel ribbon, becomes magnetized when it is put in contact with a permanent magnet. It is also known that a piece of steel introduced into a selenoid becomes magnetized, and reains so, as long as a magnetic field is maintained by a flow of current in the wire of the selenoid. If we take a long ribbon of steel and with the aid of a spooling device draw it along the pole of an active electro-magnet, the steel ribbon or wire becomes uniformly magnetized. If we alter the magnetism of the electro-magnet while the steel ribbon or wire is drawn along its poles it is evident that this steel ribbon will become unevenly magnetized according to the variation in the strength of the current which alters the degree of magnetism of the electro-magnet. If the changes in the magnetic flow are brought about by speaking into a microphone inserted in the circuit between the battery and the electro-magnet, the current impulses, produced by the microphone will affect the electro-magnet, between the poles of which a variable magnetic field is created, and the steel ribbon or wire will become magnetized in the rhythm of the sound vibrations. The voice will then be magnetically recorded on the steel wire.

This same sound can be reproduced from the wire if a telephone receiver is set in the circuit in the place of the battery and the microphone. The modulated magnetized wire made to run on the poles of the electro-magnet will create induction current impulses which will make the diaphragm of the telephone receiver to vibrate in unison with the impulses produced by the microphone, thus reproducing, in a distortionless manner, the voice recorded upon the wire.

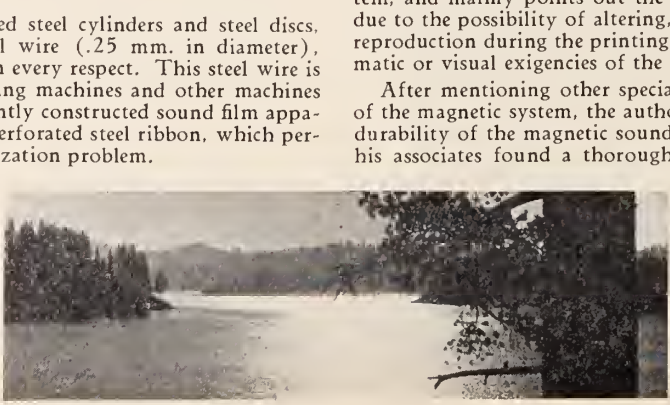
The sound record can be easily obliterated from the ribbon or wire by simply magnetizing the wire evenly throughout its length.

The wire is at first polarized with current values that stand in very distinct proportion to the current intensities of the sound recording to be made afterwards.

The material used, the form and position of the magnet poles, are of extreme importance.

In earlier days, the author used steel cylinders and steel discs, but later decided upon thin steel wire (.25 mm. in diameter), which proved to be satisfactory in every respect. This steel wire is still used by the author in dictating machines and other machines for special purposes. For the recently constructed sound film apparatuses the inventor uses a thin, perforated steel ribbon, which permits the solution of the synchronization problem.

It is of interest to note that this process has permitted to decrease the running speed of the sound record. Paulsen determined the most favorable speed at 3 meters (approximately 11 feet) per second, that is to say, that 3 meters of wire had to pass the recording electro-magnet in one second in order to obtain good recording. By steadily improving the process the author succeeded in reducing this speed to about 1 meter (a little better than 3-1/3 feet) for speech and to 1.2 meters for music. This decrease in speed has considerably increased the efficiency and the noiselessness of the mechanism.



The steel band carrying a record synchronized with picture, is at the present time made to run at a speed of 60% faster than the picture record. It is well to note that since the thickness of the steel band is only 0.05 mm., the size of the film and steel reels are the same.

According to the author, frequencies up to 10,000 per second can be registered on the steel band with the devices now available. This is amply sufficient for the purpose of sound film.

Higher frequencies were recorded in an experimental way.

Comparison of the electro-magnetic system with the process of optical recording of sound on film, reveals the fact that both processes are entirely free from inertia. This leaves to the electro-magnetic system the great advantage of eliminating all the processes which are inherent to the film, such as the developing and printing, which processing cannot be done without influencing the final results.

The modulated sound track of the steel ribbon can, after recording, be immediately reproduced with the same volume and quality that is needed for theatre performances, later on. It is superfluous to mention the advantages that directors, actors and sound engineers are enabled to derive from this extremely desirable feature.

The process of printing is also free from inertia and since it is done without necessitating the laboratory processes inherent to sound recording on film, the copies obtained are of the same quality as the original.

Due to the possibility of recording high frequencies, the tone quality, when reproducing, is of the highest brilliancy and plasticity—the hissing sounds, such as the sound "S," are faithfully reproduced. Whispering being done several feet away from the microphone, as well as the fortissimo of an orchestra, are registered with absolute clarity. The sound characteristics of different instruments, and of the piano, above all, are most perfectly reproduced.

The necessary apparatuses are very simple in construction and, therefore, reasonable in price. The essential parts of the reproducing apparatus consist of two reels on which the steel band is being fed and taken up by a few guide rollers driven by a synchronious motor and by means of a sprocket.

The author stresses great emphasis on the pliability of the system, and mainly points out the easiness of editing sound records, due to the possibility of altering, at will, the volume of the sound reproduction during the printing process, and according to the dramatic or visual exigencies of the edited picture.

After mentioning other special possibilities afforded by the use of the magnetic system, the author concludes by stressing upon the durability of the magnetic sound record. He describes how one of his associates found a thoroughly rusty wire spool in the attic, among other rubbish, and conceived the idea of cleaning it and running it through the reproducing apparatus. The reproduction was as good as that of a record freshly made, although that particular record was recorded in the year 1913.

The author minimizes the effect that a concussion would

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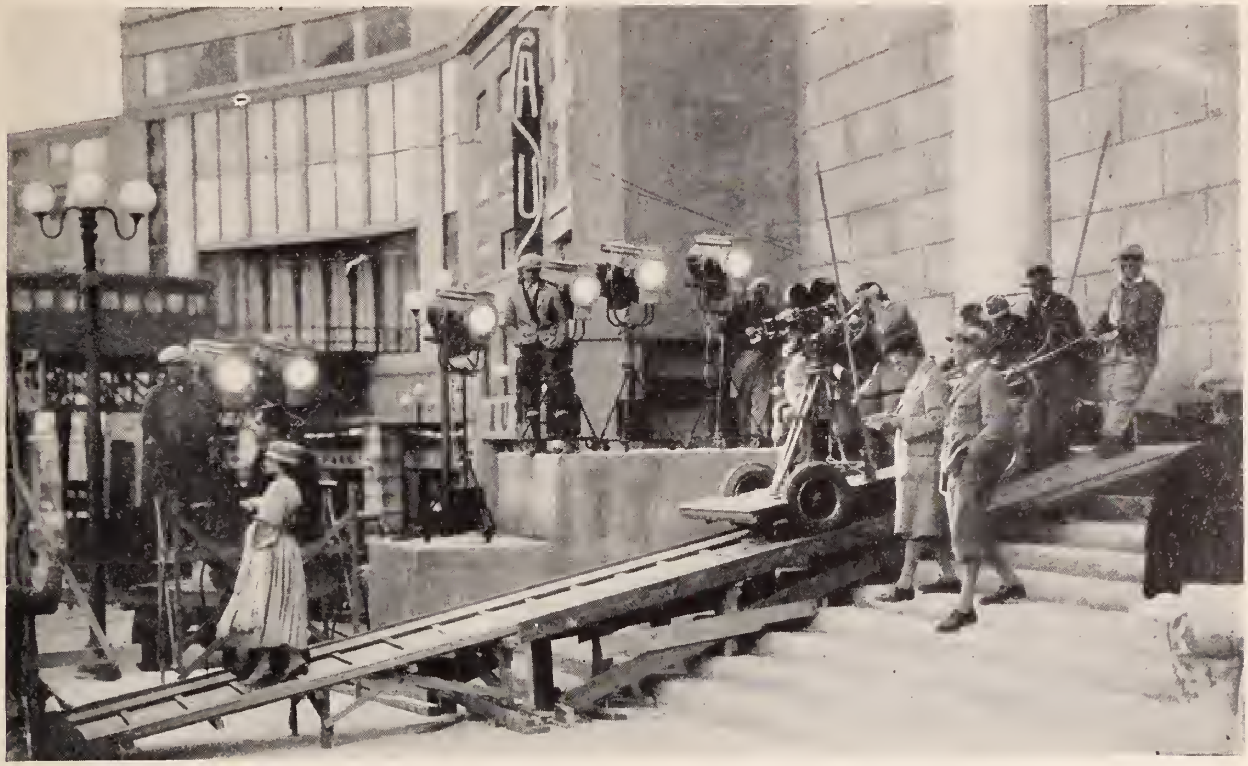

F. W. Murnau and Karl Struss directing a scene with Janet Gaynor and George O'Brien for "Sunrise," a Wm. Fox production. Brown Ashcraft High Intensity Spotlights boosting daylight

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Some Properties of Fixing Baths

(*Continued from Page 4*)

6. *Time during which the films remain in fixing bath.*
7. *Age of fixing bath after mixing and previous to use.*
8. *Rate of agitation of film in the rinse and fixing baths.*
9. *Time of washing.*
10. *Temperature of the various solutions.*

In the above tests a standard developer and emulsion was used throughout, and the time of rinsing, fixing, and washing; the degree of agitation during developing, rinsing, fixing, and washing; and the temperature of all solutions was maintained constant. At the outset, the effect of the alkali retained by the gelatin on the hardening produced by the fixing bath was not considered but in all of the cases studied the quantity of alkali retained by the film was held constant so as not to affect the results.

Later experiments showed that the temperature and age of a fresh fixing bath had some effect on the hardening properties even though the bath had not been used. In the experiments the baths were prepared within at least an hour previous to the tests and maintained at a uniform temperature.

The rate of increase in temperature of the bath in which the melting point tests were made affected the determined melting point; that is, the greater the rate of temperature increase, the higher was the apparent melting point. The degree of agitation during the melting point determination materially affected the results. Mechanical agitation was at first tried but this was found to produce inconsistent results over a series of test strips. It was decided that uniform, vertical, hand agitation was the most desirable the frame being moved up and down twice each minute. It was observed that flashed portions of the test strips melted at the same temperature as the gelatin which contained no silver.

5. *Developer Capacity*

(a) The quantity of MQ_{25} which could be added to a fixing bath before the precipitation of aluminium sulfite occurred was considered as its useful developer life or capacity. Although the addition of a given quantity of developer may not produce a precipitate immediately at normal temperatures, the bath will frequently precipitate a considerable quantity of aluminium sulfite after standing for a period of several days. The developer life tests were made by placing samples of the fixing bath containing varying quantities of developer in a hot room at 110° to 115° F. and noticing the quantity of developer required to cause precipitation of aluminium sulfite. For practical purposes the developer capacity was recorded at both 70° F. and 110° F.

(b) In order to test the effect of the addition of developer as carried over by films or prints on the hardening properties of a fixing bath, varying quantities of MQ_{25} were added to the fixing bath and hardening tests made on these samples as outlined previously.

All of the properties of a fixing bath, other than the rate of fixation, are so closely related to one another that it is impossible to discuss one without considering its correlated influence on the other properties of the bath, and for this reason the experiments on the various properties of the fixing bath as outlined above will be discussed under the one heading of "Hardening Action."

IV. The Time of Fixation of Hypo Baths

The chemistry of the processes of the dissolving of silver halides by sodium thiosulfate (hypo) is generally considered to be as follows: The silver halides are probably dissolved in three steps, namely (1) a white insoluble silver thiosulfate is first formed which is further acted upon by the hypo with the formation of (2); a colorless and soluble silver mono-sodium thiosulfate and this reacts again with the hypo forming (3), a water soluble silver di-sodium thiosulfate. The following equations represent the probable chemical reactions involved in the case of silver bromide:

(1) $2\,AgBr + Na_2S_2O_3 = 2\,NaBr + \underset{\text{Silver thiosulfate}}{Ag_2S_2O_3}$

(2) $Ag_2S_2O_3 + Na_2S_2O_3 = \underset{\text{Silver mono-sodium thiosulfate}}{Ag_2S_2O_3.\ Na_2S_2O_3}$

(3) $Ag_2S_2O_3.\ Na_2S_2O_3 + Na_2S_2O_3 = \underset{\text{Silver di-sodium thiosulfate}}{Ag_2S_2O_3.\ Na_2S_2O_3}$

In recent years it has been questioned whether a film which is just cleared is completely fixed or whether the film should be allowed to remain in the fixing bath for double the time required to clear. Experiments by Bullock,[8] and Lumière and Seyewetz[9]. indicate that a just cleared film is completely fixed and experiments by the authors have confirmed this observation.

The time required for fixation of any emulsion depends on several factors as follows:

(1) The nature and thickness of the emulsion.

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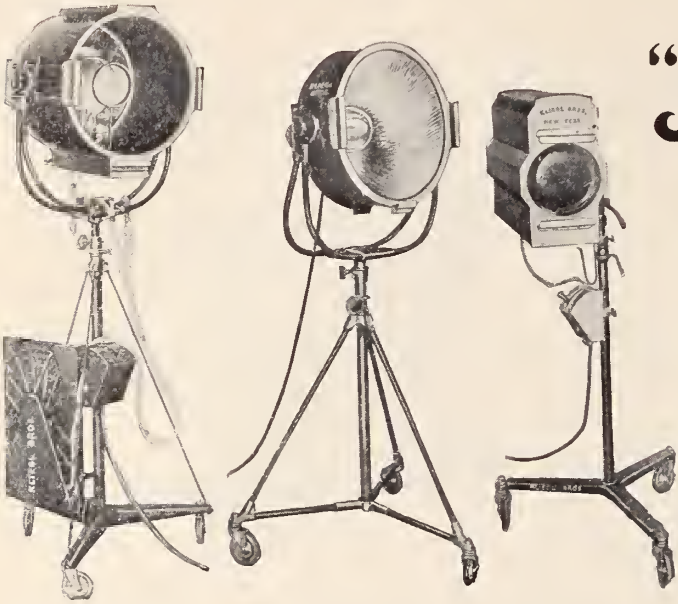

Smith & Aller Provide Experimental Stage for Cameramen

Experimental set for cameramen at Smith & Aller's Hollywood building. It is fully equipped with every modern appliance.

RECOGNIZING the need for an experimental stage where cameramen may work out their ideas during their spare time, the firm of Smith and Aller, Pacific Coast distributors of Dupont film, last month completed work on such a stage and now announce that it is at the disposal of the cameramen of the industry to be used gratis at any time the cinematographer wishes.

After long and careful deliberation, this enterprising firm, which had been looking over the field to see where they might be of greatest service to the cameramen, decided to convert one section of their beautiful new plant at 6656 Santa Monica Boulevard, Hollywood, into such an experimental stage.

An interior set 20 by 12 feet was built, with keen observance of acoustic conditions conducive to the making of sound pictures. It has been colorfully and attractively furnished so that it is admirable for either black and white or color photography.

The very latest in incandescent lights have been procured, and provisions of space have been made for back-lighting. Adequate space is provided for lamps above the set and a complete lighting equipment has been installed. Special ventilators have been constructed above the set to provide sufficient air and add to the coolness and comfort.

Reception Room at Smith & Aller Building

The room in which this set has been built is long enough so a shot of sixty feet may be made. A charmingly furnished dressing room has been provided; and, in short, it is the last word in an experimental set for the use of the cameramen.

"We have provided this set for the use of the cameramen," declared Mr. Smith, "because we have felt for a long time that the cameramen needed and would find much use for such a set.

"Now, we hope the cinematographers will make themselves at home here and use the set as though it were their own," added Mr. Aller. "If there

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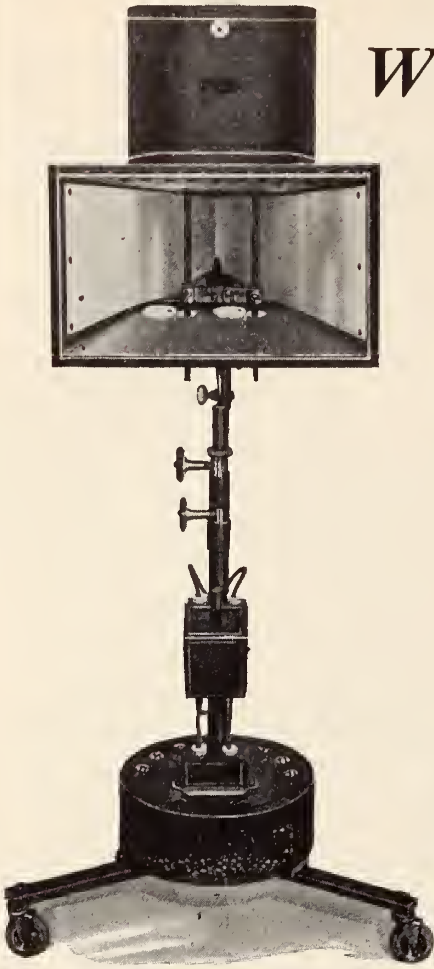

New Arc Lamp Introduced By Otto K. Olesen Company

One of the most important announcements in the motion picture lighting field during the past month comes from the Otto K. Olesen Illuminating Company of Hollywood.

This organization has been quietly at work on the new lamp in conjunction with the engineering department of the National Carbon Company and now offers the studios a side arc lamp which the Olesen firm declares gives fifty per cent more light than any other lamp on the market.

The outstanding features of this new "OKO" arc lamp are the reflectors. These, according to R. E. Nauman, chief of the electrical engineering department of the Olesen firm, are made of a specially constructed chromium-plated copper. It is on the material used in the reflectors that the Olesen firm and the National Carbon Company engineers have been working for some time, according to Nauman.

"This new side arc lamp," says Nauman, "is the last word in lights. It is correctly designed for proper angles of dispersion and gives an increased reflector overall efficiency that is almost unbelievable. This lamp, with the new type reflectors, gives fifty per cent more light than any lamp of its size on the market, and will be a revelation to the studio technicians.

"We have been quietly working with the National Carbon Company on this new studio lamp and are confident that we have produced a product that will soon be found on every set."

Incidentally, Nauman predicts a rapid return to the universal use of arcs in the making of talking pictures.

"The idea that arcs couldn't be used in making talkies is being rapidly discarded," says Nauman. "There is hardly a studio in Hollywood now in which you do not find arcs in use. They are the only lights for sharpness of definition and experience is proving them decidedly practical for talkies."

Oakland Firm Wants Scenes Depicting Life and Customs Abroad

AN UNUSUAL opportunity is now offered to studios and cameramen to dispose of negatives photographed in foreign countries.

After a careful investigation of the educational field, Veritas Films, of 829 Harrison Street, Oakland, California, has embarked in the field of supplying 16 mm. films showing life and customs in foreign lands. This firm wishes to provide for the schools and other purchasers of its product pictures which are untainted by propaganda. They want nothing but the best authentic shots that show the foreign countries as they really are—not as the publicity propagandists of the countries wish them to be portrayed. In other words, this firm is providing truthful pictures to teach the youth of our nation how people in other countries work and live and play.

Already they have brought out such 16 mm. releases as "Reindeer Herds of the Arctic," "Dwellers of the Northland,"showing natives in their homes in Alaska and northwestern Siberia; "Valley of 10,000 Smokes," a photographic study of this little known region; "The Life of the Salmon," "Work Dogs of the North," "Fur Farming in Alaska," etc.

They want to purchase foreign negative from studios or cameramen who have such on hand or stored in their vaults. A cash or royalty basis is offered. The company wants all the interesting foreign negatives it can get, and will reduce the 35 mm. to 16 mm. for release prints. Additional information may be obtained by writing Veritas Films direct, or by writing the Editor of the American Cinematographer.

Borax Developer

(*Continued from Page 5*)

Other workers have shown that high sulfite concentration tends to produce fine grained images. From a practical point of view a developer which gives a satisfactory fine grain with maximum effective emulsion speed is to be desired. A sulfite concentration of 75 grams per liter was found to give satisfactorily grain free images, and at the same time to give a high effective emulsion speed.

Borax

The borax appears to influence the development only through its effect on the alkalinity of the solution and hence its effect can be completely presented only in conjunction with other factors affecting the alkalinity of the developer. For the simple case, varying borax only, Fig. 3 shows the effect on the development for the 8 minute period chosen. Increasing the borax increases the alkalinity (represented by increasing pH) with a resultant increase in the activity of the developer. With the quantity of metol used in this series, there is little difference between development with 5 and 10 gm/1. of borax.

Reducers

In the first series of tests with its low borax concentration it soon became evident that the hydroquinone did little of the development. When the basic formula indicated for this series was mixed with the omission of metol, 16 minutes agitated development gave a barely perceptible density at the longest exposure given the test strip. Needless to say, such development is worthless. Mixing again, this time including the metol but omitting the hydroquinone produced a fairly satisfactory developer; one which produced densities which differed but very slightly from those produced by the complete formula.

In the case of the second series a similar test was made, the results of which are presented in Fig. 4. Here the borax concentration is higher than in the previous case and the hydroquinone alone does develop noticeably, but still not enough to make a worth while developer by itself. Metol alone is very satisfactory and the densities differ but little from those produced with an additional 5 or 10 gm. hydroquinone. The tests showed a tendency for fog to increase more than in proportion to the additional development produced by the increase of hydroquinone. The net result was that cleaner more satisfactory development was obtained by increasing the time some twenty percent with metol only as a reducer. The degree of increase of fog with hydroquinone differed somewhat between different emulsions, and in many cases was serious.

With metol alone as a reducer, the image density for fixed time of development does not increase indefinitely. Fig. 5 shows a series of curves with increasing metol concentration. It is to be noted that the alkalinity of the developer, pH, decreases due to the addition of the metol, which is sold commercially as a sulfate and hydrolyzes liberating acid in the developer, making the solution less alkaline. The activity is thus so reduced that 10 g/l. of metol gives less development than 5 g/l. The increased concentration can be made more effective by progressively increasing the borax content as the metol is added, if that increased activity is desired. A balance of 5 g/l. borax and 2.5 g/l. metol together with 75 g/l. of sulfite gives a developer which very closely approximates the development rate of other borax formulas in use, and at the same time makes economical use of the expensive reducing agent.

Potassium Bromide

The fog produced by this developer is sufficiently low so that no bromide is needed as a restrainer. The retarding effect of bromide is shown in Fig. 6. Even with small quantities there is a marked loss of effective emulsion speed.

The accumulation of bromide and other developer reaction products does not rapidly impair the development characteristics. Fig. 7 shows the results of an exhaustion test with this developer. It will be noted that after 400 ft. per gallon had been developed, 12 min. in the old developer and 8 min. in the fresh developer produced a density of approximately 1 for equal exposures. This longer development, however, gives pictures with slightly less shadow detail than the shorter development time gives in fresh developer. The alkalinity of the developer under observation remained practically constant, showing that the necessary increase in developing time comes as a result of the reduction of concentration of reducer and the accumulation of bromide and reaction products in the developer rather than to alkalinity decrease. The practice of renewing a borax developing bath with additions of borax serves to bring the rate of development back to the original figure but can not bring the detail giving power which has been lost through the progressive bromide accumulations. The permissible tolerance will vary somewhat with the class of work, and will determine the "life" of the developer.

1. C. E. K. Mees & C. W. Piper; Phot. Jour. L11 p. 225, 1912.

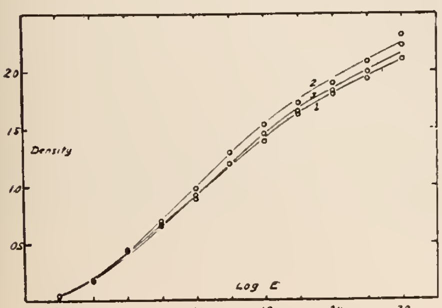

Fig. 5. Eight minute developments with: Sodium sulfite, 75 g/1; metol, varied; borax 5 g/1. Emul. 2568.

Curve No.	Metol	pH	Fog
1	2.5	9.0	.07
2	5	8.6	.05
3	10	8.2	.07

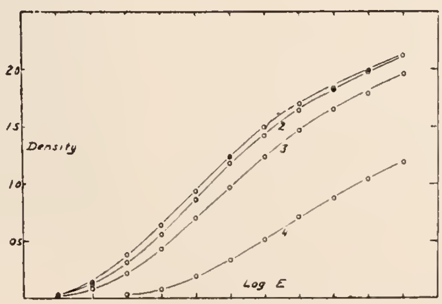

Fig. 6. Eight minute developments with: Sodium sulfite, 75 g/1; metol 2.5 g/1; borax, 5 g/1; potassium bromide, varied. Emulsion 1612.

Curve No.	Bromide	Fog
1	0	.15
2	0.1	.12
3	0.5	.08
4	2.5	.04

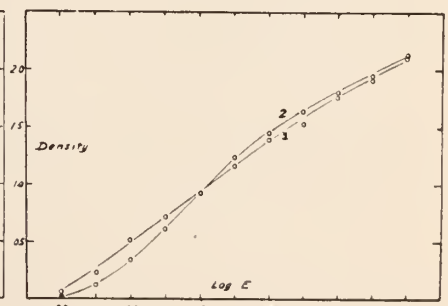

Fig. 7. Exhaustion test of the developer recommended.

Curve No.	Feet per Gal.	Time of Development of Test Strips
1	0	8 min.
2	400	12 min.

Du Pont-Pathe Perfects New Tinted Positive Film

A new type of positive motion picture film has recently been perfected by the Du Pont-Pathe Film Manufacturing Corporation which combines a clear sound track with a tinted picture area on one piece of film, according to an announcement by this company.

"This feat in manufacturing technique," says the announcement, "has removed one of the great disadvantages inherent in sound-on-film processes and makes possible once again the use of tinted stocks; an artifice which has long been employed for emphasizing dramatic effects and for giving the proper settings for a wide variety of out-of-door scenes.

"Up to the present time it has been necessary to print all sound-on-film pictures on black and white stock. This was because the commonly used tints removed such a large proportion of the rays to which photoelectric cells were sensitive that light which passed was inadequate to properly actuate the cell.

"Attempts have been made to get around this difficulty by film manufacturers through choosing tints which transmit the active rays but are of limited interest because it happens that many tints which were popular and widely used in silent pictures and which the public has learned to associate with definite dramatic moods can not be duplicated by tints which conform with the standards imposed by the photoelectric cells.

"The new type Du Pont stock frees the presentation of high class talking picture production from a serious limitation (placed upon them by the advent of sound) and should prove a decided factor in the advancement of the art."

*A*scot *R*ace *T*rack *L*ighte

AUTOMOBILE racing at night in the past was for a long time a question somewhat similar to that of Television today: practical, but to what extent no one was able to say.

With Television, the extent of practicability remains a question; something that the future will reveal. However, the problem of night automobile racing has been solved, proven and accepted by no less an authority than the A. A. A. (American Automobile Association). And this acceptance was not given until the solution had passed he rigid scrutiny of A. C. Pillsbury, Director of Operations for California, Arizona and New Mexico. And in addition to Mr. Pillsbury, Fred J. Wagner, noted official starter, passed on the solution which in the last analysis, is lighting.

With that same spirit that has made The American Legion famous, the Glendale Post, No. 127, decided to inaugurate night racing, knowing that others had tried many times, but had failed to accomplish the extremely difficult task, of not only lighting the track, but getting the A. A. A. to accept and approve it.

All preliminaries had been arranged for holding the races at the Ascot Speedway up to the point of lighting the track. But who could do it was the question. It was to involve the expenditure of a large sum of money and looked like playing a "long shot." Who had a reputation in this field that was an absolute undisputed authority and could accomplish it under such drastic requirements? After a prolonged study of the field of lighting engineers, the committee made a visit to the Coliseum at the time of the Shrine Convention and were finally convinced after conferring with the various committees that the only one capable of guaranteeing results on as large a scale as this, was Otto K. Olesen Illuminating Company, 1560 Vine Street, Hollywood, Calif.

After a conference with Mr. Olesen, the contract was let. Speculation was rife among the drivers as to whether the outcome would be a success. The outstanding requirement in the engineering of the project was safety. The track is ⅝ of a mile in diameter, 60% of which is curved, and as the average qualification time is 30 seconds per lap, the cars would be traveling at 1¼ miles per minute or 75 miles per hour, which in turn is 110 feet per second. At that speed, a failure of the lighting system would be disastrous, to say the least. An even flood of light was required with no glare to the drivers. That is, lights could not be placed at any point that would cause the drivers to look into them while racing. The shadow of the car was the next issue. At no time could the shadow be in front of the car. It was to be located in such a way that it would not bother the driver; that is so he could not see it and think it was another car. This in itself was no small problem. How the lighting was worked out is best described by R. E. Nauman, chief Electrical Engineer of the Olesen Company.

"We will start with the first issue, 'Safety'," says Mr. Nauman. "Service was contracted for with two separate Power Companies for the full amount of the load, 80 Kilowatts. The load was then div d through the medium of double throw switches—half of it on Pc er Company 'A' and the other half of it on Power Company 'B.'

The Cradle f

IN THIS BUILDING *at 900 Broadway, Bayonne, N. J*
David Horsley started making motion pictures in 0
the Motion Picture Patents Company was formed in 1 8
join except the Centaur Company. The excuse for barr- t
This then became the birthplace of the independent m n
as Mr. Horsley says, "became so big it killed the trust hi

) FOR NIGHT AUTO RACING

"The load consisting of forty 18-inch projectors equipped with ›arobolic mirrors and using 2000-watt G 48-115 volt lamps, twenty ›f these lamps were on one line and twenty on the other.

Ecture Liberty

r). 22 feet wide, 52 feet long, on a lot 100x25 feet, nder the firm name of Centaur Film Company. When ery single company in the United States was allowed to firm was that "They only had a wash tub and a sink." ure industry of the United States, and "in five years," tried to strangle it in the place where it was born."

"The placing of the beams on the track was next. First a lamp on Power Company A was set. Then another from Power Company B, and so on alternately, so that in the event of failure of either Company, the entire track was lighted with light and dark intervals of equal distance, approximately 83 feet each. This leaves the driver in this dark area about seven-tenths of a second, but with a lighted area ahead of him as a guide. If a thing of this nature should occur it would last less than a second, as the switch for that half of the load would immediately be thrown over to the other Power Company. On test this has been accomplished in an interval too short for the eye to detect. Observers have not been able to tell that the load was changed from one Company to another.

"The second issue was easily met by an even overlapping of the beams.

"The third, of controlling the shadow as well as glare, was overcome by placing the light source in the geometrical center of the track. As the turns are made to the left this places the shadow on the right, and, of course, keeps it there. Now came the problem of making the shadow very short or close to the car so that it would not interfere with a driver that was passing. This meant to place the lights very high in the air. This was done by the isue of seven, seventy-foot poles, set seven feet in the ground and placed in a ten-foot radius, making a twenty-foot circle, with one pole in the center. A platform was then built on the top with the center pole acting as a ladder to the top. A railing was then provided and equipped to accommodate twenty of the lamps and the other twenty operated from the floor of the structure. A hoist was built to raise and lower the gate, etc. All switching appurtenances, transformers, and meters are on the ground level.

"Of all the favorable comments made by the various drivers, this remark was best, when asked how he liked the lighting he replied, 'It's better than daylight.' Of course, I was curious and pursued my question farther by asking how he arrived at that conclusion, and the answer was as follows:

"'Well if it was a day race, it would be in the afternoon and the sun would be low in the sky. This would mean that at one place in the track you would be driving into the glare, which puts the shadow of your car back of you and also puts back light on the dust and makes it hard to see through. On the opposite side the shadow will be in front of the car and the dust will be front lighted; while on either end the shadow will be first on one side and then on the other with the dust cross-lighted, an ever changing condition with nothing constant, along with the fact that at night everything is dark but the track and nothing distracts from your driving' All in all a pretty good analysis.

"Since the installation of this lighting system automobile racing at night at the Ascot track has become one of the popular sports of Southern California and officials from tracks in various sections of the country are turning their eyes toward California for the solution of their lighting problems."

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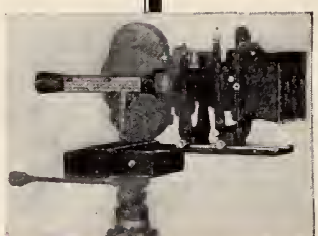

Top — Micro-Focus Meter on Bell & Howell Filmo 70.

Center — Matte Box and Micro-Focus-Meter on Victor camera.

Bottom — The Title Hood on Eastman Cine Kodak.

"Amateur Fuzz"

"Bad Lighting"

"Untitled Reels"

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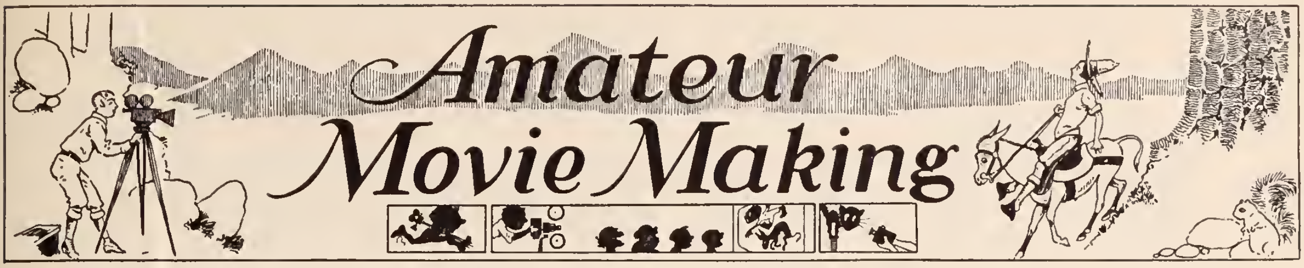


By WM. STULL, *A. S. C.*

AFTER the average amateur has filmed the antics of the entire family a few times over he finds the problem of what to shoot next looming larger and larger on his horizon. After all, Baby's first step can only be filmed once, and Uncle Charley's famous "Dance of the Seven Veils" can hardly be repeated with its original success. The pictures taken at the beach were a lot of fun—but after the second picnic is filmed, and found to be merely a repetition of the first, both reels are usually laid aside and forgotten, like last year's snapshots. At this stage, the camera is very likely to follow them unless the user finds within himself the key to renewed interest in his hobby. If he finds it, though, there open to him endless new vistas of enjoyment, recreation and knowledge.

And yet this key is no magic talisman, but merely the application of common-sense to cinematography. If random cinematic snapshooting fails to bring lasting satisfaction, it is only logical to expect that perhaps deliberate, planned filming might succeed. If purposeless films don't please, films made with a definite purpose should, shouldn't they? And they usually do. In the first place, if they have been carefully planned, they have generally been well enough thought out beforehand to eliminate most non-essential and uninteresting details in advance. In the second place, if they have been made with some definite underlying purpose, they usually bring to the screen enough of that purpose to arouse and hold audience-interest even after many showings. Incidentally, their conception and realization is splendid mental (and physical) exercise, as well.

The Dramatic Subject

Of course, the first subject that comes to mind for such premeditated filming is the dramatic film. It offers a vast and fascinating field of endeavor, but it is usually far beyond the scope of the individual worker. Where there is a group interested in such production, there is nothing more interesting—nor more exacting; but for the individual, it is generally entirely out of the question.

There are countless other subjects which offer the individual as extensive fields as his ability can grasp. His hobbies, his travels, his work, even his daily surroundings, can all be made into pictures of most surprising interest. There are, for instance, innumerable surgeons who find the cine camera invaluable to their work, and an interesting diversion, as well. Here in Hollywood, one renowned surgeon has a library of several hundred reels of his own operations, and finds the making and reviewing of them a most instructive practice. There are here, too, a number of cine amateurs who have found both pleasure and profit in cine-micography, while many archaeologists and geologists carry filmos on their field trips as a vital part of their equipment.

Golfers, Attention!

Not all of us, however, are so scientifically-minded that we can enjoy filming and viewing appendectomies, spirozoa, or Pleistocene deposits. Fortunately, such things do not entirely exhaust the range of possible subjects for advanced filming. Far from it! There is hardly a phase of normal modern life which has not the germ of a screen subject latent somewhere within it. For instance, four out of every five adults are either golfers, or golf-widows; and what a series of interesting reels cannot be built up around that ancient and honorable game! Imagine the endless possibilities of normal-speed, slow-motion and natural-color reels merely of one's own game. Then similar studies of the play of champions, supplemented by the reels commercially obtainable of the same subjects. And this holds good for tennis, baseball, cricket, football and all the sports. Racing? What endless and spectacular opportunities the followers of the turf have! And as for the rapidly-growing air clan—what can't they do? Imagine the thrilling interest of making and owning a series of reels showing the rudiments of flying—the outstanding types of planes at rest and in action—of scenes from aloft on one's own flights—and of famous flyers and their machines. How interesting and valuable we'd find such films of the pioneer flyers and their amazing little machines—and today's men and machines will be just as interesting tomorrow. But aircraft alone need not be the sole subjects of such collections. There are photographers who have for years specialized in building up collections of still pictures of locomotives, of motor-cars, of ships, and even of bridges. Now imagine the interest of making such a series in motion—perhaps also in color!

Then, consider all of the interesting things that can be filmed during even a short vacation. Aside from the beaten paths of vacation films there are innumerable possibilities. In fact, the little, ordinarily-overlooked subjects are often more interesting than the more obvious ones. Short reels, for example, on wild life, flowers, clouds, and so on, can be made objects of lasting interest. A few years ago, for instance, the writer, while on a vacation trip in Southern Oregon, found enough material between times to make a fascinating little reel merely on rivers! Another time, a vacation on an Eastern farm resulted in several reels showing in detail the various operations of farm life—planting, cultivating, harvesting of crops, stock-raising, and so on.

Fields Are Varied

But there are vast fields of interest quite aside from these more or less mechanical films. Wherever we are, whatever we do, can in some way be conceived as an interesting subject. Visit an exhibition of paintings or a salon of pictorial photography. What diverse subjects have been turned into beautiful pictures by the magic of the artist's brush or lens! Little things we ordinarily pass by unnoticed, yet having within them, latently, the seeds of beauty and interest. I recall at a recent salon a most striking print which showed merely the rear axle and wheels of some forgotten Ford, half submerged in the oily water of a squalid ditch—yet the photographer's eye had seen the spark of interest in it, and had made of it a most original and decorative picture.

We need not deliberately seek the junk yards in search of such objects of potential interest and beauty. Every day there pass by us scores of little scenes which could be made lasting pictures of beauty and interest, did we but see and record them.

Years ago there lived in Paris a man who saw these things, and longed passionately to perpetuate them. Yet he could neither draw nor paint, so he turned to the then-despised camera as the sole remaining method of expressing his artistic yearnings. With it, he found his mètier, his recreation, and his life-work. Today, the records which he so painstakingly made are priceless, for, aside from having served as inspiration for innumerable great paintings, Eugene Atget's 10,000 photographs of the Parisian life of his day are recognized as artistic achievements on their own merits.

He did not merely photograph the obvious; had he done so, both he and his work would long since have been forgotten. Instead, he sought and recorded those thousand-and-one little moments of Parisian life of the '90s which were so much a part of the city's life that they were generally completely ignored. Shop windows—full of wasp-wasted corsets, or amazing shoes; the street-vendors passing the time of day with the pushcart man; organ-grinders; sellers of chestnuts and ices; horse-cars; omnibuses; shady courtyards; shadow-splashed walls; inviting gateways—all of the myriad tiny details that formed his Paris. Every one of them technically perfect: vibrant with motion, though perforce time-exposures; and composed and lighted in a way worthy of the best of present-day camera-masters. In all, a wonderful collection. Imagine what it would be like, granted the boon of living movement! And yet, there are equal opportunities offered us all, today, wherever we live, if we will but see, and act.

Whether we live in Oslo or Omaha, Cambodia or California, the opportunities are there if we will but see. And if we do see, and build upon a firm foundation of technical excellence a structure of cinematic beauty, there is no limit to the joy and interest held by our hobby; no need to fear it will ever lose its tang, for as we work, strive for better technique and increased appreciation of the beautiful, its horizon will always advance before us, as we go our way through its endless, fruitful fields.

S. M. P. E. Fall Meeting Slated for Toronto

THE annual Fall meeting of the Society of Motion Picture Engineers is scheduled to be held at Toronto, Canada, according to announcement by President L. C. Porter. The meeting will start October 7 and end October 10, according to present plans.

Canadian and other members of the S. M. P. E. have been making an insistent demand for the convention, as none have been held there since October, 1923, when Ottawa was the fortunate city.

Attendance at the Spring meeting in New York last May was the greatest ever; but officials of the society declare that they expect the Toronto meeting will break all previous attendance records. Officials of the society report a tremendously increased interest and activity during the months since last May, and announce a greatly increased membership.

Los Angeles Firm Provides Club and Projection Rooms for Amateurs

VERY often the enjoyment of a perfect vacation is seriously marred by the fact that home and its facilities for editing and projecting one's films must necessarily be left behind. This is particularly true when one can find no place to show vacation films to the friends that appear in them, or else must show them in their worst condition—unedited and incoherent.

In Los Angeles, however, such misfortunes are no longer necessary, for one of the city's oldest and best-known photographic houses has recently announced the provision of a large and comfortable clubroom to serve as a cinematographic home for visiting and local cinematographers. The B. B. Nichols Company, extending their familiar policy of friendly service to the amateur, are remodeling the quarters directly above their store at 731 South Hope Street, and have thus far provided a large and pleasant projection room, completely equipped with all systems of both black-and-white and color projection, which they invite amateurs to make use of. Plans are also under way for the provision of smaller, private rooms in which the amateur may edit and project his 'rushes' undisturbed.

The personnel of the Nichols' cine department, headed by Mr. H. W. Devereaux, is at all times ready to help the amateur on any point that may arise. As Mr. Devereaux is a veteran of long experience in both studio and amateur cinematography, and keenly interested in the amateur and his problems, the value of this service is apparent.

In addition to this, the firm maintains one of the largest and most complete precision cinemachine-shops on the Pacific Coast, presided over by an expert cinema engineer. Here every imaginable repair and alteration can be made without the delay and expense of sending the camera or projector to an Eastern factory, and with a precision and accuracy rarely achieved even in the factories themselves. If a thing can be done at all, it can be done in this shop, where the watchwords are precision in workmanship, and reasonableness in prices.

These changes are parts of a general program of expansion now being instituted in the Nichols Cine Department, whereby they hope to extend their established policy of quality merchandise and friendly service to make it available to a larger number of cine amateurs than ever, and more helpful.

INFORMATION FOR AMATEURS

Amateurs—Send your problems to this department and have them solved by the world's finest cinematographers—the members of the A. S. C. This is your department. Our aim is SERVICE. Write us and find your answers here.

Question from L.D., Davenport, Iowa: Can thin, overexposed 16mm. reversal films be intensified?

Ans.: We believe so; these films can be dye-toned the same as ordinary prints, so they should be able to be intensified, too. However, the light and heat of the projection-lamp might have some effect on the intensified image, so we recommend that you keep the film in the dark as much as possible. Incidentally, dye-toning might serve to build up the density of the image, too.

Question from R.S., Macon, Ga.: I want to try some of the back-lighting effects I see in professional films, but the instruction-books say never to make a picture except where the light comes over your shoulder. Is there any special device the studio cameramen use to get these effects?

Ans.: You can get the effects you want with any amateur camera if it is equipped with a lens-hood, or sunshade, and care is taken that the direct rays of the sun do not strike the actual lens surface. In back-lit shots, the light should come from behind, and to the side of the subject, and the best results are gotten when the sun is fairly high in the sky. Of course, you should use some sort of reflector to illuminate the shadowed side, so the detail there won't be lost.

Question from M.T.R., Pittsburgh: I am planning a foreign trip. Should I carry a supply of film with me, or can I get it as I travel?

Ans.: It largely depends where you are going. Eastman, Agfa, and the other firms have branches in most of the chief cities of the world where supplies are available. However, if you are going to the tropics, or for long sea-voyages, we recommend that you get your film from the manufacturers, in the specially sealed tins provided to exclude dampness in such conditions. They will also gladly furnish you with a list of their branches and processing-stations if you wish it.

Question from R.H., Omaha: What is the reversing solution used for the Agfa reversal film?

Ans.: Potassium bichromate, 5 grams in 1000cc. of water, sulphuric acid 10 cm. The last should be added slowly and cautiously, as heat is generated. The negative should be well rinsed before reversal, otherwise the developer alkalies weaken the reversal bath.

Question from T.S., New York: Is there any motion-picture camera made with a focal-plane shutter?

Ans.: Yes, the Akeley has such a shutter, in the form of a cloth curtain which revolves completely around the inside of the case, passing directly in front of the film. It permits the absolute maximum of exposure. The reason this form of shutter is not used in amateur cameras is lack of space. However, the revolving shutter used is nearly as efficient, as it is behind the lens, and very close to the film.

Question from M.R.S., Portland: How can I make my backgrounds in close-ups diffused?

Ans.: Simply bring your subject away from the background several feet. Then when you focus on the subject, the background will be diffused.

Question from R.B., Los Angeles: What type of reflector would you suggest for back-lighting a woman's hair for close-ups?

Ans.: This depends on the hair. For example, an ordinary mirror is the best reflector to use in cases where the subject has brilliant, fiery red hair; also for a very golden blonde. But a softer reflector should be used for a distinct brunette. I would suggest, as a home-made affair, that you use a reflector painted with dull white or a dull silver paint. For a chestnut brown head of hair or an ordinary blonde, use a reflector of glossy finish or one covered with tin foil.

And, while on the subject, let me add that wise use of reflectors will be a distinct aid to securing better pictures. Reflectors are easily made. Just use a square of light wood, size according to what you want—I'd suggest three feet high by two and one-half feet wide. For soft reflector paint it with dull white. For hard reflector, paint it with glossy white enamel or cover with tin foil. These are a remarkable aid to good photography as they soften shadows and prevent pronounced contrasts.

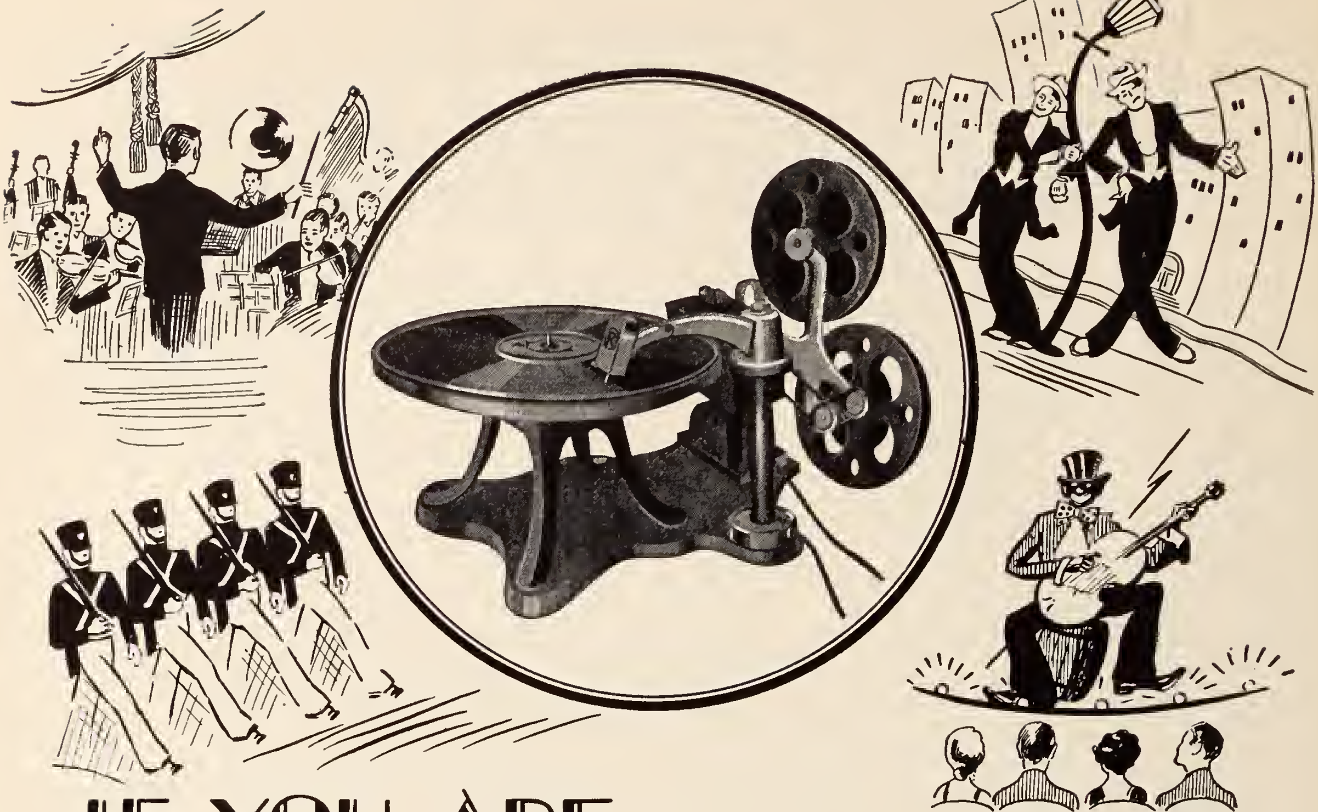
"Bub" North Screen

A new, improved "Bub" North Screen is now on the market for both Kodacolor and black and white picture projection. The rigid type of frame is used, and the fine textured projection surface will always be perfectly flat, as its base is 14-gauge aluminum, which, of course, will not warp nor wrinkle. The new screens are mounted upon a separate inner frame which may be lifted out and placed face inward within the outer frame. This protects the projection surface.

Story of Spark Plug Filmed

In this day and age of the automobile and airplane a spark plug, while one of the most important factors in our lives, is such a common article that we scarcely give it a thought, except when we need a new one.

However, the U. S. Bureau of Mines, Department of Commerce, has taken the spark plug and has produced a film showing the making of this little article that is attracting much attention. It is called "Along the Firing Line, or the Story of the Spark Plug." Great pains were taken in the filming of this picture which shows every possible angle of the work that is done to make the plug. Real thought and artistry have been shown and instead of being a tiresome subject it has been made into a picture that is pleasing to the eye, entertaining and very instructive.



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Preparing Projection Programs

Your Friends May be Getting a Free Show, But They Should be Considered, Nevertheless, or Your Showmanship Prestige May Suffer

By SYRIL DUSENBERRY

THE preparation of a suitable program for the home movie show is a phase of movie making that has been sadly neglected. Many amateur workers handle their camera with great skill but when it comes to arranging an interesting program for the entertainment of the home movie audience they are hopelessly lost. Too many movie makers delight in inflicting their pet films on their patient audience without regard to whether they may be interesting to them or not.

Our first consideration is the length of the average home show. Ordinarily it should run between an hour and an hour and a half. This means about five or six four-hundred-foot reels of 16 mm. film. An excellent show can be made up of four such reels and it is recommended that the program run not over this amount unless a feature picture itself is five reels, in which event another short subject reel can be included to round out the program. Unless the pictures have unusual merit or are of special interest it is too much to ask the average audience to sit through programs of greater length at a home movie show.

We are now ready to delve into the depths of selecting suitable subjects. In order to guide the movie maker in the preparation of an appropriate program, the table accompanying this discussion has been prepared with great care. At first glance, some of the suggestions may appear quite obvious and self-evident, but experience has shown that many of these often slip the mind at the crucial moment. While this table was compiled for use by movie makers using 16 mm. film and having a rental library at their disposal, it can be readily adapted to those using standard film.

Let us examine the table of suggested subjects for a moment. Children, as a rule, enjoy several short pictures rather than a single long one, hence nothing in the juvenile class is longer than two reels. The mind of a child is taxed when it is asked to follow a long and, perhaps, complicated story. Adults, on the other hand, seldom care for a hodge-podge of subjects, but prefer one good feature. Young people of the collegiate type want pictures that move forward with a snap and strongly object to slow moving scenics and preachy stories with a moral. When the interests of a particular audience are definitely known, these should be catered to diplomatically without making it appear that a special effort was made to secure the particular subjects shown.

In the preparation of this table, no reference has been made to the movie maker's own films. These can be readily substituted, reel for reel, in place of any suggested subject in the table. If the movie show is in the nature of a formal entertainment, a balanced program of half library reels and half home-made reels is recommended. Of course it goes without saying that only home movies of exceptional merit should be exhibited at such an entertainment. It is often wise to show only a single home-made reel! This reel should be built up of the best available material and should be considered as a "show-off" reel. Every movie maker should endeavor to build up an "exhibition library" from his best material by making up a reel for each general subject, for example, one family reel, one travel reel, one reel of local events and, perhaps, one reel of scenic wonders. It is easy to build up such reels as most movie makers accumulate considerable film and it is very little trouble to splice the best scenes on to the proper exhibition reel.

The secret of successful showmanship is to avoid giving your audience too much. It is far better to leave the audience clamoring for more than to give a long, tiresome program. When in doubt, make the show too short rather than too long and, above all, remember that, in projection programs especially, variety is the spice of life.

Audience	Two 400 Foot Reels Half hour Show	Four 400 Foot Reels One Hour Show	Six 400 Foot Reels Hour and half show
JUVENILE	2 Reel Feature Comedy a) Slap-stick style b) Animated Cartoon c) "Our Gang" type ---- or ---- 2 Reel Child Story a) Fairy Tale b) Animal Story	1 Reel Natural History a) Animal or bird life b) Scenic wonders 1 Reel Comedy a) Animated Cartoon b) Dog or Monkey Comedy c) Rough and tumble type 2 Reel Child Story a) Fairy Story b) Wild West Story c) Historical epic type	1 Reel Nature picture 1 Reel Popular Science 1 Reel Animated Cartoon 1 Reel Travel a) Foreign child life b) Historic Scenes 2 Reel Comedy
COLLEGIATE	1 Reel Sports a) Athletic Contests b) Wild West Rodeo c) "How to do it" type 1 Reel Comedy a) Romantic type b) Bathing girl type c) Clean cut stunt type rather than slap-stick	1 Reel Sports 1 Reel Comedy 2 Reel Feature Story a) Western Action type b) Light romantic type c) Newly-wed light comedy d) Flaming youth or flapper jazz life story	1 Reel Sports 5 Reel Feature Story a) Western Action b) Mystery thriller c) Gangster type d) Romantic love story c) Jazz night life type e) Airplane romance (Avoid tragedy, classics, and religious stories)
ADULT	1 Reel Travel or scenic a) Unusual foreign b) Scenics with action c) Scenic sport such as fishing or hunting 1 Reel Feature Comedy a) Domestic married life b) Light Romantic type c) Clever stunt type	1 Reel Travel or Scenic Wonders 1 Reel Light Comedy 2 Reel Dramatic Feature a) Gripping Dramatic type b) Stories of society or business life c) Eternal triangle type	1 Reel Travel or Scenic 5 Reel Dramatic Story a) Problem Play type b) Society Drama c) Heart-throb Drama d) Detective mystery e) Sophisticated type

Table of Suggestions for Home Movie Programs

Of Interest to Amateurs

New Eyemo Key

USERS of Eyemo Cameras who have long wished for a winding key which can be left permanently in its socket in the camera, may now have their wish fulfilled. Such a key, according to announcement by Bell & Howell, is now available.

This key is of the new folding, ratchet type, similar to the key now furnished with Filmo 70 cameras, and may be left permanently attached to the Eyemo or detached at will. It should be a great convenience.

Oiling Filmo Projector

BELL & HOWELL give the following information which should be of value: "If your Filmo Projector bears the serial number 47313, 47316, or a higher number than the latter, be guided by the following directions in oiling it: The machines specified do *not* have the two oil holes on the clutch side which are indicated by the letters 'B' in Figure 19, Page 22, of the latest Filmo Projector instruction book, Form No. 15,011. Instead, an oil hole at the top of the gear case, near the oil cup, is employed to lubricate the main bearings."

The Cinophot

IF you are addicted to over-expose your pictures because of the intensity of mid-summer light, you will find the Cinophot, a compact and handy exposure meter, one of the most valuable bits of your cinematic equipment. This meter insures accurate exposure and is so small it can be carried comfortably in the coat pocket. The Drem Products Co. supply these exposure meters for any type of camera and an amateur will find one invaluable.

Watch Water

NEVER allow excitement to spoil a good picture. Always be careful. Better miss a picture than spoil it. Blurred pictures are often caused on rainy days, or when you are shooting near a waterfall, by water splashing on your lens. No matter how great the excitement, take time to look at the lens, and if it is wet, dry it with a clean, soft, lintless cloth.

Heinz Products

REPORTS from the Movie Specialty Manufacturing Company, of Los Angeles, indicate that the new matte-box, micro-focus meter and title hood introduced by this firm last month, are making a decided hit with the amateurs. These three new products give the amateur the tricks of the professional and should have a big sale.

Preparedness

IT IS a pretty good rule to always keep your camera loaded. You never know when something of interest will turn up. If you have to load your camera, you may find yourself in a position similar to a hunter who carries an empty gun as the game is flushed.

Remote Control

MUCH pleasure may be derived from the use of the remote control for the Filmo 70 camera. Pictures you would never get are possible at a distance up to fifty feet. For nature studies we can think of nothing more useful. Try it on that little song-bird in your front yard some morning.

Preserve Your Films

UNLESS you take care of your films you will discover, some day, that perhaps the most valued picture you have taken is ruined. The material from which film is made grows brittle with the passing of time. The film cracks and picture is ruined. If the film-owner takes necessary precautions, this can be avoided. There are various processing methods of excellent repute on the market which preserve films throughout the years. Kleena-fylm is one agency that gives this preservation. A little on a blotter placed in the film can occasionally will save that precious film.

"Trial Mates"

ONE of the most charming and interesting 16 mm. pictures to come out in months is "Trail Mates," offered the public by Veritas Films, 829 Harrison Street, Oakland, California.

This subject, 800 feet length, was made in Alaska by Captain Jack Robertson and is a masterly bit of photography, carrying with it a theme of tense interest. The picture is being acclaimed by all who see it as the finest motion picture brought out of Alaska. Veritas has it ready for the owners of home projectors. Incidentally, this form has a series of ten one and two hundred foot reels of tremendously interesting pictures shot in Alaska, showing life as it is there.

How Professionals Make Up

June Collyer and Helen Twelvetrees Give the Amateurs Some Inside Information on the Art of Making Up for the Screen.

By James M. Fidler

WHY is it that so many of my friends, many of them beautiful girls, do not photograph well? Why do they seem to have dark circles under their eyes and blotches on their faces when we project our 16 m.m. pictures on our home screens?"

This question is one that amateur cinematographers and amateur players are continually asking whenever they have the opportunity to get in touch with any professional. Again and again the amateur points out that he has been particularly careful about his lighting, but the faces of the beautiful girls still look muddy and unattractive.

The answer usually lies in the art, or lack of art, in making up. The amateur buys his or her makeup and proceeds to apply it as he or she thinks best. The result brings tears.

June Collyer, brunette, and Helen Twelvetrees, blonde, Fox stars, have come to the partial rescue of the amateur readers of this magazine with an inside peep into just how they make up. A careful perusal of their methods may help.

Helen Twelvetrees

"Poor makeup," says Miss Collyer, "can spoil the appearance of the most beautiful girl for the screen. And, it must be remembered that what makes a blonde beautiful will make a brunette look a fright.

"In making up for the screen, my first step is to go over my face thoroughly with cold cream," Miss Collyer explains. "This is rubbed into my skin so that the grease paint, which is put on next, may lie smooth. After the grease paint (I use natural pink) is evenly spread, I use ice water to pat it in. This water prevents shininess, and is an important part of the process.

"After this, the face powder. I use pan-chromatic, also natural pink. This I put on with a powder puff. I then pat it carefully into the grease paint with my hands. Next, I brush away the surplus powder, leaving a smooth, velvety finish.

"Next comes a small portion of brown eyeshade, rubbed softly as a shadow around the eyes. This must be very soft, else the camera will cause big hollows to appear where the brown shading has been applied. I next use a brown eye-brow pencil to outline my eyebrows and brown mascari for my lashes.

"My lipstick synchronizes with face powder in color. Before putting this on, I make sure that all powder has been removed from my lips. If any clings, the rouge will not be even and may cast shadows in photographing. This is something to watch carefully. For my hands and arms, I use a liquid makeup of natural shade. This is carefully rubbed on, is allowed to dry and is then brushed off very smoothly and softly. Always watch for smoothness."

June Collyer in her dressing room at the Fox Studios in Hollywood

Miss Twelvetrees, describing the method she employs to makeup for the screen, said as follows:

"I use Max Factor's number 24 screen makeup. After first applying a coat of cold cream to cleanse the skin and to form a base for the makeup, I put on the grease paint. This I rub into the skin. I use a natural tan shade, light. After the grease paint is adjusted, a pan of cold water into which I dip my hands is nearby. The cold water, carefully patted over the grease paint, removes shininess and promotes smoothness.

"Next, I put on a small quantity of eyelid shade, tan in color. I then put on a reddish brown lip stick, heavier than I use for ordinary street wear. My next step is to put on the powder. This is also a very light tan in color. I apply it with a fluffy powder puff, using plenty of powder. I then pat the powder into place, afterward brushing away the surplus powder with a soft bristled brush (we call them 'baby brushes'). Be sure that all powder is removed from the lips and eyelids. If necessary, both can be retouched.

"I use a dark brown mascari and I give the lashes a fairly heavy coating. *I suggest this particularly for blondes with blue eyes as it helps to bring out the lighter colored eyes.* It is not necessary with dark-eyed girls.

"For my arms, bands and shoulders, I use a light tan shade of liquid makeup, rubbed in thoroughly and brushed off after drying."

Miss Collyer's new pictures, soon to be released, are "Magnolia" and "Illusion." Miss Twelvetree's late pictures are "The Ghost Talks" and "Blue Skies." After reading the descriptions the two players give for their screen makeups, a visit to see them as they appear on the screen might prove wise for the amateur photographer who wishes to see just what results are achieved by these two girls.

Miss Collyer adds one word of warning to girls who apply their own make-up for amateur film work. It is: Watch your eyes. Do not dab great gobs of blue, green or brown around your eyes. Experiment and do not put on so much that it gives you rings around the eyes."

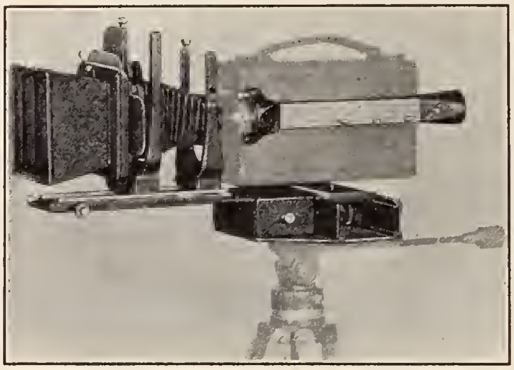
Questions regarding make-up by amateurs will be answered by Max Factor, noted make-up authority, if sent to the Amateur Department of this magazine.—EDITOR'S NOTE.

FORMER AUTOMOTIVE ENGINEER AIDS SERIOUS-MINDED AMATEURS

Shots Demanding Gauze-Vignettes, Multiple Filter Combinations, Dissolves and Multiple-Exposure Effects Now at Command of Amateur.

By WILLIAM STULL, *A. S. C.*

UNTIL very lately the development of amateur cinemachinery has been more in the line of producing cinematic Brownies for the many, than in making motographic Graflexes for the advanced few. Rightly so, too, for though there were thousands of potential beginners in cinematography, there were few, if any amateurs sufficiently advanced to handle apparatus of any great refinement.



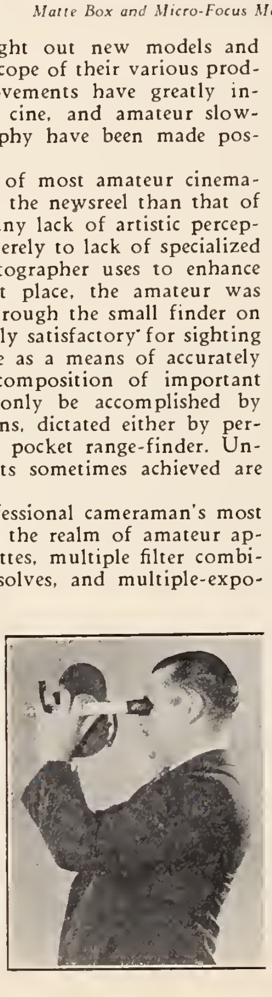
Matte Box and Micro-Focus Meter on Cine Kodak with tripod.

Now, however, conditions are changing. Throughout the world are thousands of expert cine amateurs who have completely mastered their simpler outfits, and are eagerly seeking new worlds to conquer. In recognition of this the various manufacturers have from time to time brought out new models and accessories, progressively widening the scope of their various products. Lens-turrets and multispeed movements have greatly increased the flexibility of the amateur cine, and amateur slow-motion and natural-color cinematography have been made possible.

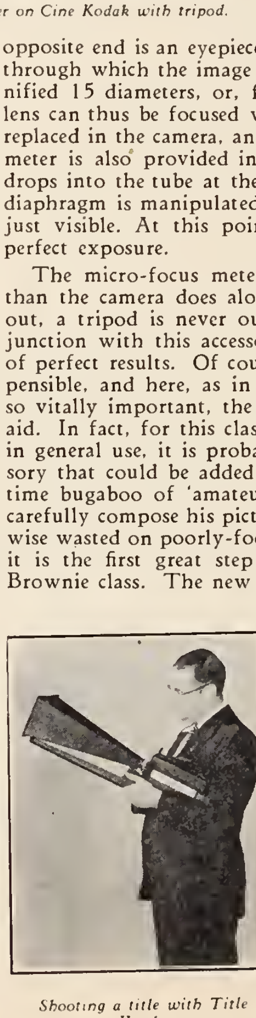
None the less, the artistic standard of most amateur cinematography has been more closely that of the newsreel than that of the studio. This has not been due to any lack of artistic perception on the part of the amateur, but merely to lack of specialized equipment such as the studio cinematographer uses to enhance the beauty of his scenes. In the first place, the amateur was forced to compose his picture solely through the small finder on his camera; a device which is thoroughly satisfactory for sighting ordinary shots, but entirely inadequate as a means of accurately studying and arranginb the artistic composition of important scenes. In addition, focusing could only be accomplished by means of the scale engraved on the lens, dictated either by personal judgement or, occasionally, by a pocket range-finder. Under such conditions, the artistic results sometimes achieved are truly noteworthy.

Secondly, the matte-boxe—the professional cameraman's most vital accessory—simply didn't exist in the realm of amateur apparatus. Shots demanding gauze-vignettes, multiple filter combinations, moonlight or fog effects, dissolves, and multiple-exposure effects were nice things to see in a theatre, but for practical purposes they were absolutely impossible. Professionals might make them—but amateurs? Oh no! Refinements for the production of such effects were built into studio cameras as a matter of course, but were thought far too advanced for incorporation in any amateur apparatus. Amateurs might long for them, but that was all; they simply couldn't get them anywhere.

However, as cine amateurism spread, the number of advanced amateurs capable of using such devices has also increased. To them it will be of great interest to learn that such devices are at least available for use with all amateur cameras, using focusing mount lenses. Within the last month there have appeared on the market two auxilliaries of proven worth, which may be incorporated with any 16mm. cine camera, and which give it all the flexibility and refinement of the most expensive professional models. These devices are the invention of O. W. Heinz, of Los Angeles, and are, respectively, a micro-focus meter and matte-box for amateur cameras.



Using Micro-Focus Meter without tripod.



Shooting a title with Title Hood.

The first of them, the micro-focus meter, is essentially a focusing tube which is mounted at the side of the camera. At the forward end is provided a lens-mount identical with the one on the camera, into which the lens may be quickly slipped; at the opposite end is an eyepiece, adjustable to individual requirements, through which the image cast by the lens is seen, erect, and magnified 15 diameters, or, for critical focusing, 22 diameters. The lens can thus be focused with absolute accuracy, after which it is replaced in the camera, and the scene photographed. An exposure-meter is also provided in the form of a blue glass filter which drops into the tube at the touch of a lever, after which the lens-diaphragm is manipulated until the detail in the shadows is only just visible. At this point the setting is absolutely correct for perfect exposure.

The micro-focus meter does not require a tripod, any more than the camera does alone, but, as has been frequently pointed out, a tripod is never out of place in cine work; and, in conjunction with this accessory, a tripod forms an added assurance of perfect results. Of course in telephoto work a tripod is indispensible, and here, as in color work, where accurate focusing is so vitally important, the micro-focus meter is a most invaluable aid. In fact, for this class of work, to say nothing of its utility in general use, it is probably the most valuable all-around accessory that could be added to any camera, for it banishes the old-time bugaboo of 'amateur fuzz,' gives the amateur a chance to carefully compose his picture, and saves a great deal of film otherwise wasted on poorly-focused or uninteresting scenes. In a word, it is the first great step in taking the cine camera out of the Brownie class. The new matte-box is primarily intended for use with the microfocus meter and a tripod, and adds to any 16 mm. camera the advanced features of the finest professional apparatus. In fact, it has some conveniences which would be welcomed on professional equipment. The matte-box itself is practically identical with the best professional models, and includes the customary sunshade, adjustable bellows, iris, three filter or matte-holders, and a set of vertical and horizontal dividers. The ensemble is so mounted that the units may be swung in any direction, either individually or collectively. The whole is mounted on a double-extension rack-and-pinion mount, so that it may be used with any lens, including telephotos. To the rear, the camera is mounted on a swinging base, so that it, like a professional camera, can be swung to one side while shot is being lined up through the micro-focus meter, and then swung back so that while photographing the lens is in exactly the same position occupied while focusing. Underneath the mounting are drawers in which gauzes and filters may be kept. In short, every refinement and advantage offered by the most costly professional outfits is embodied in these devices, which can be added to any amateur camera. With them practically everything in the professional's bag of tricks is available to the expert amateur.

In addition to these two appliances, the same firm also offers an unusually practical tilting outfit. It consists of a simple metal hood which fits over the lens of the camera, and carries at its outer end a slit into which the title to be photographed is slipped. The title-card is considerably larger than the ones generally used in amateur tilting devices, and allows much greater freedom in the style of lettering, decorations, etc.

The lettering may be written, typed or printed on any translucent material desired, after which the making of the title is simplicity itself, as all that is necessary is to slip the title into the hood, point the camera toward the light, and shoot. The range of effects is almost unlimited. Everything from the simplest 'on the spot' memoranda to the most intricate trick and art-titles can be made. With a transparent base for the lettering, moving backgrounds can be used, and dissolves made from title to scene with telling effect. The device also offers a most simple way of making animated cartoons, maps, and titles. And since approximately 1/3 of the footage of a silent picture is usually devoted to titles, its value is obvious.

These three articles are the creation of O. W. Heinz, of Los Angeles, who enters the new field of activity after a long and distinguished career as an automotive engineer. "I came to California," he states, "several years ago, in the course of an automotive survey for an Eastern firm. Once here, I liked it far too well to be satisfied anywhere else, so eventually I settled in Los Angeles. In my work there, I found it necessary to employ 16 mm. movies for instructing large staffs of subordinates. The more I worked with the films, which I made myself, the more enthusiastic I became about them; but I found so many limitations—so many things I wanted to do, but couldn't, that I began to get irritated.

"Finally my mechanical training got the better of me, and I decided to work out some accessories that would enable me to do what I wanted with my camera. The result is embodied in these three devices. The first models of each attracted so much favorable comment from both amateurs and professionals that I was finally persuaded to arrange for their manufacture. Though they have only been announced for a very short time, the reception they've had everywhere to indicate that I wasn't wrong in my decision, and that there are many serious amateurs everywhere who welcome these devices as a means of adding the professional touch to their pictures."

Dunning Process Company to Build New Plant

CARROLL H. DUNNING, head of the Dunning Process Company, Hollywood special process technicians, has announced that his concern is now having plans prepared for a new plant.

Land has been purchased on La Brea Avenue, south of Santa Monica Boulevard. The building will be two stories high, and will cover an area of 50 by 100 feet. Mr. Dunning says that when the new plant is completed it will enable his firm to do eight times its present business.

Present plans call for every modern device and bit of equipment for special process photography and title work.

France

Mr. Henri Pathe, French Under-Secretary of State, has caused a series of lessons on Physical Culture to be reproduced in a film, which will be exhibited in various schools and colleges in order to propogate rational methods of physical training.

An interesting invention was recently demonstrated in Paris by Dr. Couchoud. Proceeding from the fact that the retina of the human eye is concave, Dr. Couchoud is showing motion pictures on a concave screen. The films thus exhibited cannot be defined as "stereoscopic films," but they give a much greater impression of relief than a picture projected on an ordinary screen.

Russia

A Japanese film exhibition is now to be seen in Moscow. It provides a very clear picture of the present status of the Japanese production and of its peculiar character.

Solving the Ice-Box Problem

(*Continued from Page 7*)

provided at the rear through which it may be viewed. Another important addition, for which Mr. Toland is responsible, is a device by which the focus may be adjusted from the outside. The lens-mount is made with a V-shaped groove in which a small belt fits, and extends to a pulley below, to which is attached a dial calibrated for several lenses. As the position of this lower assembly is adjustable, it can quickly be adopted to any lens. This improved "Blimp" can be used from a tripod, but it is generally mounted on a special perambulator, whose height is quickly adjustable, and which makes moving shots even more conveniently easy than they were before sound pictures came.

At the Pathe Studios, the problem was tackled by Art Director Edward Jewell, who has turned out one of the most original devices of its kind. Externally, it looks more like an Indian cliff-dwelling gone astray than anything else, but it works, and is a very satisfactory silencer. It is made of two papier-mâché shells, between which is a layer of sound-absorbent material. At the front a flaring opening surrounds a removable glass window, through which both lens and finder peer. The matte-box is inside the case, as is the motor, making a very convenient, self-contained unit. There is provision made for following focus on moving shots, the focus being indicated on a scale below the front of the camera. The unit is used on any standard tripod, but insulated from actual metallic contact therewith by its over-hanging base. A unique feature is the absence of doors for getting at the camera within: instead of this, the whole device is separable from the base, and may be lifted completely away from the camera—hence its nickname "the Hat." Several of these devices have been made, and found satisfactory under production conditions by such members of the Pathe camera department as Arthur Miller, A. S. C., and Norbert Brodine.

At the Paramount Studio, the chief cameraman, Virgil Miller, A. S. C., has, after much research, adopted a device known as the "Baby Booth." This device is the creation of Roy Hunt and Robert Smiley, of the camera department, and is just what its name implies—a miniature booth. It is a good-sized, square box built around any standard camera, and constructionally very like the big booths. It stands on a special tripod which has, in addition to its legs, a three- wheeled undercarriage which is raised or lowered by the turn of a crank, and which can be entirely removed, if necessary. The "Baby Booth" itself is sufficiently large to allow ample working space around the camera, or to accommodate even the wide-film outfits now being experimented with. The device retains the familiar optical-glass window in front, on which provision is made for mounting mattes and gauzes, and around which is built a large metal sunshade. Both the finder and motor are contained inside the case, making the unit an extremely mobile one.

Inside, it is probably the most luxurious device in use, for it furnishes the cameraman with every possible convenience. There are small lights for illumination while threading the film; an automatic clutch which disconnects the motor while threading the film, or whenever a buckle occurs; a "bloop light," for marking the starting-point of a scene, which may be worked from either inside or out of the booth; and an extremely accurate device for focusing, which operates from the outside, and which moves the finder to exactly agree with the changing focus of the lens. The focusing arrangement consists of a permanent lens-mount, into which all the lenses fit, around which a small chain operates, connecting with a lever on the outside of the booth, and a large indicating quadrant inside. This indicator is at the rear of the case, easily visible through the large rear window, and illuminated by a small lamp contained in the pointer. The calibrated scales on the indicator are interchangeable, so that each lens has its own accompanying scale; as these scales are absolutely accurate, the value of this feature for present-day cinematography is obvious.

The Paramount Studio is at present experimenting with a special camera of their own manufacture for use with these "Baby Booths," but current production is being carried on with standard Bell & Howell and Mitchell sound cameras. The "Baby Booths," themselves, are so completely successful that the studio is completely equipping itself with them as fast as they can be made. During the experiments which finally resulted in this accepted model of the device, a number of interesting designs were tried, including one which embodied a layer of glass in its walls, to achieve the maximum silence with the minimum bulk.

In the same line—that of securing silent operation with minimum bulk—a number of individual cinematographers have carried on much worthy research. At the Tiffany-Stahl lot, Jackson Rose began by ruthlessly ripping the glass from his booth, and substituting sheets of sound-absorbing felt, leaving only a small hole to photograph through. This was so successful that he next made an overcoat for his camera, a padded robe so suggestive of "Spark Plug's" famous attire that the staff at once dubbed it a "Barney Google." It is literally an overcoat to be thrown over the camera, allowing the lens to project from the front, the finder from the side, and the motor-cable from the rear. The afterpart is fitted with a "Zipper" fastening, so that immediate access may be had to the camera without removing the whole cover, and a small window is left just over the take-up pulley, as a check against buckles, and such mishaps. The device is so simple and practical that its use should spread to all companies using adequately silent cameras.

Another similar device is the most original one made by Joseph Walker, A. S. C., at the Columbia Studio. Walker decided that, since the main thing was to prevent the noise of the camera from escaping, the logical process was to catch it as near the source as possible. Therefore he devised a regular suit of armor for his camera—a set of back-and-breastplates of moulded sponge-rubber, covered with leather, which fit directly onto the camera, parts of which have already been treated with acoustic padding within. Covered this way, the camera is scarcely larger or heavier than before, and all controls are readily accessible, yet the major part of the noise is effectually smothered. For safety, a sheepskin hood is thrown over the camera, and the outfit is ready to work.

The final step in this direction is that taken by the Fox Studio, where blanketed cameras—specially treated to reduce their noise-making capacity—are used for all purposes. And as the manufacturers are steadily improving their products, it is hardly to be doubted but another year's progress will see camera booths entirely eliminated, and cameras being used as freely as before. When such is the case, a very great share of the credit will belong to the cinematographers and other technicians whose artistic devotion and inventive genius have again triumphantly risen to surmount the obstacles of the apparently impossible; to the men who don't know how to say, "It can't be done!"

Heat Treatment of Steel

"The Heat Treatment of Steel" is the subject of the latest addition to the library of educational motion picture films produced by the Department of Commerce for the visualization of the mineral industries of the country. The film was made, under the supervision of the United States Bureau of Mines, in co-operation with one of the large automobile manufacturing companies. It is brought out that some 1475 separate steel parts of a typical automobile must be given special heat treatment, illustrating forcibly the importance of this process in the automotive manufacturing industry.

The film begins with a few scenes illustrating the early days of motoring and recalls to mind the fact that the automobiles of the nineties were extremely uncertain quantities as compared with the dependable and efficient motor cars of today, which the heat-treatment process has helped to make possible.

The old-time methods of tempering steel, with anvil and forge, when the color of the metal alone indicated the degree of tempering, are shown. Then in contrast, the various steps in the modern methods of heat treatment, utilizing specially designed furnaces subject to the utmost precision of control, are illustrated. The heat treatment of steel, it is pointed out, is the process of so heating and cooling the metal as to intensify the hardness, toughness or flexibility of the steel.

It is shown how the furnaces are heated by crude oil under pressure, constituting a baking process with the source of the heat away from the metal. The use of extremely delicate electrical temperature indicators, or pyrometers, for the automatic regulation of the high temperatures is visualized. Other scenes show the cooling of the heat treated parts in an oil bath, composed of 4,000 gallons of special, expensive oil kept in constant circulation.

The various steps in the forging of the front axle of an automobile are depicted, from the time that the chemist analyzes the steel for the carbon content which determines the extent of heat treatment required. Microscopic comparisons of the steel before and after its subjection to the heat treatment process are shown. The process of surface hardening of the steel parts is also depicted. Various processes of physically testing the heat-treated steel are illustrated.

Copies of this film, "The Heat Treatment of Steel," are now available for exhibition by educational institutions, churches, clubs, civic, business and military organizations, and others who may be interested. Applications for the use of the film should be addressed to the Pittsburgh Experiment Station of the United States Bureau of Mines, Pittsburgh, Pa. No charge is made for the use of the film, although the exhibitor is expected to pay the cost of transportation both ways.

Some Properties of Fixing Baths

(Continued from Page 19)

(2) The nature and degree of exhaustion of the fixing bath.
(3) The temperature of the fixing bath.
(4) The degree of agitation of the film.

(1) In general, course-grained emulsions fix much more slowly than those composed of finer grains. For example, under any given conditions Eastman motion picture positive film fixes in about one-fifth the time required for Eastman negative motion picture panchromatic film. A thickly coated emulsion obviously fixes more slowly than one of less thickness.

(2) The times of fixation for various concentrations of sodium thiosulfate at 55° F., 65° F., and 75° F. for Eastman motion picture positive and negative panchromatic film are shown in Fig. 2. The negative film fixes most rapidly in a 40% solution which corresponds with the results of Piper [10] and Lumière film, while with Eastman positive motion picture film a 30% solution gives the most rapid fixation.

Some workers have contended that the hardening of a gelatin film does not affect the rate of fixation while others maintain that it does. Sheppard and Mees[11] found that formalin hardening does not affect the time of fixation and state that in the case of hardened film which does not melt at 212° F. as compared with a film melting at 105° F., the time of fixation is the same in both cases. Experiments by the authors have indicated that although an excessive quantity of the hardener constituents retards fixation, for all practical purposes when using normal hardening baths with motion picture film, the hardener does not materially affect the time of fixation.

Strauss[12] and Lehmann and Busch[13] have observed that the accumulation of potassium iodide in a fixing bath used for fixing bromo-iodide emulsions has a considerable retarding effect on the rate of fixation. Experiments by Crabtree and Ross[14] indicate that the addition of 3 grams per liter of potassium iodide to a 30% hypo solution doubles the time to clear a negative emulsion at 70° F.

(3) The effect of temperature on the time of fixation is likewise shown in Fig. 2. With positive motion picture film an increase in temperature from 55° to 75° F. changes the time of fixation from 50 seconds to 30 seconds in a 30% hypo solution, while with negative film the same temperature change alters the time of fixation from 3 to 2 minutes in a 40% hypo solution. For maximum efficiency it is therefore necessary to maintain the temperature of the fixing bath not lower than 65° F.

(4) The effect of agitation on the rate of fixation is shown in the following table:

TABLE I

Hypo Conc.	*Nature of Film*	*No Agitation*	*Agitation every 30 Seconds*	*Continuous Agitation*	*Brush Treatment*
35%*	Eastman Panchromatic Negative	120 sec.	120 sec.	105 sec.	90 sec.
35%	Eastman Motion Picture Positive	35 sec.		35 sec.	30 sec.
10%	Eastman motion Picture Positive	150 sec.	120 sec.	90 sec.	75 sec.

*Crystalline hypo was used. A 35% solution was prepared by dissolving 35 grams in water and then adding water to make 100 c.c. of solution.

It is seen that with motion picture negative film a very thorough renewal of the fixing bath at the surface of the film by brushing causes the emulsion to clear in 90 seconds at 65° F. as compared with 120 seconds with no agitation in a 35% hypo solution. Conditions of agitation analogous to those produced by brushing rarely exist in practice.

With positive motion picture film agitation has little effect under the same conditions although with a 10% hypo solution the time of fixation is cut in half by brush treatment. The rate of agitation produced in the average processing machine corresponds approximately to that produced by hand agitation.

V. The Efficiency of Acid Hardening Fixing Baths

The practical efficiency of a fixing bath is governed by the following factors:

1. *The absolute times of fixation when the bath is fresh and when exhausted.*

In practice with motion picture negative emulsions a fixing bath is considered exhausted when the time required to clear the film is excessive, the limit being usually from 10 to 15 minutes; that is, it is considered better economy to prepare a fresh bath than to waste time waiting longer than 20 to 30 minutes for the film to fix, although at this point the bath is not actually exhausted because an emulsion could be satisfactorily fixed by prolonged treatment. (In practice the rule "time of fixing = twice the time to clear" is usually observed.)

2. *The quantity of emulsion fixed during the active life of the bath.*

The active capacity may be defined as the quantity of film fixed

A. S. C. Resourcefulness

Here we see another useful article devised by an A. S. C. member. Frank M. Cotner is seen in his automobile, on the running board of which he has fstened a special "auto tripod" for his camera. The picture explains everything and tells its own story without verbal description. Cotner says the device has proven itself very useful in chase shots.

up to the point when the time required to clear the emulsion is greater than a definite limit. This varies according to the particular emulsion to be fixed, the active capacity being much less in the case of slow fixing emulsions than in the case of rapid fixing emulsions which are usually more fine grained.

3. *The staining limit of the bath.*

That is, the quantity of emulsion fixed before the bath stains the film with average manipulation. Staining in a fixing bath may be a result of (a) insufficient fixation or (b) lack of agitation especially in the presence of free developer. If the film is insufficiently fixed any residual silver thiosulfate ultimately decomposes producing a brown stain. Also, if the bath becomes alkaline because of developer carried into it by films, the free developer reduces the silver thiosulfate in the film to finely divided metallic silver *in situ* causing dichroic fog.[2]

4. *The cost of fixing bath.*

Although with negative motion picture film a 40% solution of hypo gives the most rapid fixation as compared with 30% solution for positive motion picture film, the question arises as to whether the extra cost of the more concentrated solution is justifiable by the slightly shorter time of fixation. For average use, a 25% solution of hypo is satisfactory for fixing both positive and negative motion picture film though if time is the most valuable consideration a 40% solution for negative film is desirable.

(*To be Continued*)

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New Kodacolor Stations

LAST MONTH we published a list of the foreign stations at which users of Kodacolor may have their film processed. Since then the following stations have been completed with equipment to serve the amateurs. We suggest that travelers paste the complete list onto a card which they can easily carry in the same bag with their extra film. The stations are:

Madrid, Spain: Kodak Sociedad Anónima, Puerta del Sol, 4.

Buenos Aires, Argentina: Kodak Argentina, Ltd., Calle Paso, 438.

Gothenburg, Sweden: Hasselblads Fotografiska, A. B., Ostra Hamngatan 41-43.

Oslo, Norway: J. L. Nerlien, A. S., Nedre Slotsgate 13.

In the United States and Canada, Kodacolor Film is being processed at:

Rochester: Eastman Kodak Company.

Chicago: Eastman Kodak Company, 1727 Indiana Ave.

San Francisco: Eastman Kodak Company, 241 Battery St.

Kansas City, Mo.: Ciné-Kodak Service, Inc., 422 East 10th Street.

Jacksonville: Ciné-Kodak Service Co., Inc., 315 West 8th St.

Toronto: Canadian Kodak Co., Ltd., Toronto 9.

Foreign Stations

Kodacolor Finishing Stations abroad are located as follows:

London: Kodak, Ltd., Kingsway, W. C. 2.

Paris: Kodak Pathé, Place Vendome, 28.

Berlin: Kodak Aktiengesellschaft, Leipzigerstrasse 114.

Milan: Kodak Societa Anonima, Corso Vittorio Emanuele 34.

Madrid: Kodak Sociedad Anonima, Puerta del Sol 4.

Gothenberg: Hasselblads Fotografiska, A. B., Ostra Hamngatan 41-43.

Oslo: J. L. Nerlien, A. S., Nedre Slotsgate 13.

Batavia, Java: Kodak, Ltd., Noordwijk 38, Weltevreden.

Singapore: Kodak, Ltd., 8 Battery Road.

Melbourne: Kodak Australasia Pty., Ltd., 284 Collins St.

Calcutta: Kodak, Ltd., 17 Park St.

Cape Town: Kodak (S. A.) Ltd., 38 Adderley St.

Honolulu: Kodak Hawaii, Ltd., 817 Alakea St.

Havana: Kodak Cubana, Ltd., Zenea 236.

Panama City: Kodak Panama, Ltd., Edifico Grebmar, Avenue Pablo Arosemena.

Buenos Aires: Kodak Argentina, Ltd., Calle Paso 438.

Lima: Kodak Peruana, Ltd., Divorciadas 650.

Santiago: Kodak Chilena, Ltd., Alameda 1478.

Mexico City: Kodak Mexicana, Ltd., Independencia 34.

Germany

A German film week will be held in Baden-Baden and Breslau this month.

Negotiations are under way in Germany between the A. E. G. Electric concern and the Leitz factories in view of amalgamation of the two companies. The A.E.G. will, at the same time, acquire the right to construct the Meschau projector produced by the Leitz factories. This transaction is said to be in connection with the A.E.G.'s sound film interests.

The Ufa Sound Studios at Neubabelsberg (Berlin) have in six weeks continuous work so far been completed that the wiring and installation of machinery can begin. For acoustic reasons no windows have been built and the doors have been constructed in a particular way; no iron was used, the walls being made of strong burnt bricks. For the lighting, only incandescent lamps are used, having a strength of several hundred thousand candlepower. To combat the heat of lighting and to remove the dust, all the air of the vast building will be renewed six to eight times every hour. Ventilating must be absolutely noiseless and the ducts must also be soundproof against outside noises. A complicated system of signals will be fitted and every visitor will be "signalled" to the producer. A large number of scientific experts of Berlin have been consulted by the architects, Herr Otto Kohtz, and the engineer, Herr Otto Zucker. The building has the shape of a cross; four stages of sixty to ninety and forty-five to seventy-five feet size at each side, and a hall with all the technical appliances forming the center.

Greece

The Malaria Association has produced a film of approximately 5,000 feet length showing various parts of Greece affected by malaria epidemics, the effect of the disease on the population and the means of preventing the propagation of epidemics.

Austria

The "Vita" Studio of Vienna, purchased by a British financial group some time ago, will be turned into a sound film studio for the production of "talkies."

Some Properties of Fine-Grain Motion Picture Developers

(*Continued from Page 14*)

tive to a relatively low gamma and the positive to a relatively high gamma.

(C) In order to increase the rate of development the alkalinity of the developer can be increased by increasing the borax content up to 20 grams per liter. An increase in the rate of development with no increase in solvent action may increase slightly the graininess of the negative.

(D) The rate of development can be decreased by lowering the concentration of the Elon, hydroquinone, and borax to one-half that present in the regular formula. Such a developer will give slightly less graininess than the regular formula. It is very suitable for machine development where the rate of flow of fresh developer can be adjusted to compensate for the depletion of the developing agents. Hydrated sodium sulfate can be added in various quantities up to 100 grams per liter to reduce still further the rate of development and reduce the graininess.

(E) The rate of development can be controlled by using 8 grams of boric acid and 8 grams of borax per liter in the usual formula. With a ratio of 8 to 8 the rate of development is not changed. By increasing the quantity of borax with a corresponding decrease in the boric acid content the rate of development is increased. By decreasing the borax content and increasing the proportion of boric acid the rate of development is decreased. The developers with the high concentration of boric acid have shorter useful lives because the reduction potential of the developing agent is lowered and they are more susceptible to the accumulation of reaction products of development.

(F) The borax developer formula is also satisfactory for the development of motion picture positive film, but the only apparent advantages over existing developers are that it does not give aerial fog when the film is developed on a reel, while it gives a relatively low maximum practical gamma. Tests to date have indicated that the borax developer does not produce images on positive film having appreciably less graininess than those produced by existing developer formulas.

Acknowledgment

The authors are indebted to Mr. T. Gaski of this laboratory, who assisted in the experimental work.

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Electro-Magnetic Recording

(*Continued from Page 16*)

have upon the record. It is well known that a magnet can be demagnetized when submitted to a severe shock. The author points out that the magnetic record is less liable to suffer injury through these causes than a phonographic record, due to the many windings of the ribbon which give it a great elasticity and ease the strength of the shock to such an extent that even if the record layers of wire is so small that it reacts against any injurious effects.

Smith & Aller Provide Sets

(*Continued from Page 21*)

is anything that we have not provided, it will be gotten as quickly as a cameraman tells us about it. We feel certain that many cinematographers would like to have a place where they can come and shoot scenes and make experiments that they cannot do at the studios. And it is our hope that they will use this place to their hearts' content, and perhaps make contributions to the cinematographic field that they could never make if they had no place in which to experiment."

The new building of the Smith and Aller firm is a beautiful structure and has been designed with an eye to both beauty and practicability.

Color Moods

PSYCHOLOGY plays a tremendous part in life. This fact has long been recognized in many quarters, other than the college classroom, and business men who can point to a successful record invariably can trace much of their success to applied psychology.

In the motion picture business, perhaps more than anywhere else, psychology plays an important part; for on the emotions of the millions of theatre patrons depends the success or failure of pictures.

It was with a keen appreciation of this matter of psychology that scientists of the Eastman Kodak Company set to work on the preparation of the new tinted positive film which they have placed on the market under the name of "Sonochrome." And, after viewing the entire series of tints, used intelligently, the writer became just as celebrated over the tints as were the Eastman officials.

A description of these entrancing tints is almost impossible. One has to see them to appreciate them. For example, the writer had seen a certain talking picture in which a Latin-blooded girl and man enacted a rather passionate scene. It was excellent.

But when it was thrown on the screen in a "Rose Doree" tint the scene was lifted to another level. This rose pink fairly quickened the respiration, and instead of an ordinarily good scene it seemed as though these lovers, for the moment, had forgotten their world, and had been wafted to another realm on a fleecy cloud of passionate love. The music seemed better, the voices carried an added charm.

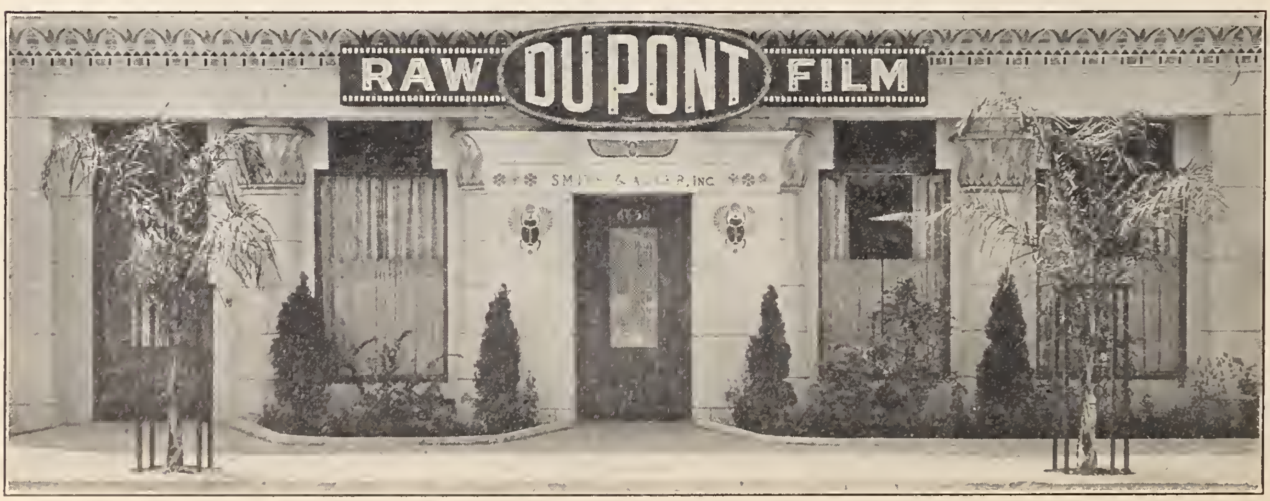
And so through the entire list of sixteen tints, the improvement over gray tones stood out like a beacon light. Firelight, Afterglow, Peachblow, Rose Doree, Inferno, Caprice, Amaranth, Fleur de lis, Purplehaze, Nocturne, Azure, Turquoise, Aquagreen, Verdante, Sunshine, Candleflame—these are the tints—entrancing, delightful, charming, effective—tints that work upon the emotions of the spectators and bring the moods desired. —[THE EDITOR].

Views Here and There Photographed for The Cinematographer

WHAT a merry life the cameramen lead in dear old Siam! Here we see Jack Smith, A. S. C. globe-trotter, doing his own laundry work while hunting elephants with Prince Svasti of Siam. The other photo shows the way cameras are carried in Siam. "Beats packing 'em on your back," writes Smith. Incidentally, Jack says that the King of Siam is seriously considering writing a special article for the American Cinematographer.

Charles Ford, Editor of the Chicago Daily News Screen Service, ready to go aloft in search of new pictures from the air? Mr. Ford always uses a Bell & Howell Eyemo which he has with him in this photo.

A corner of Max Factor's Laboratory where his famous make-up products are made.



Entrance to Smith & Aller's new film building, 6656 Santa Monica Blvd., Hollywood.

New Engineering Laboratory for Bell & Howell Completed

Chicago Firm to Have 400 Technicians Working in New Building Devoted to the Picture Industry

ANOTHER outstanding milestone in the history of the Bell and Howell Company of Chicago, was passed with the recent completion of the new $500,000 Bell and Howell Engineering Laboratory.

The new laboratory represents the last word in modern engineering buildings and President J. H. McNabb and his entire group of associates may well feel proud of their new edifice as they receive the congratulations of the cinema and engineering world.

Nearly 400 engineers and technicians will be required to operate the highest standard machinery which will occupy the 35,000 square feet of floor space of the new building. This imposing personnel will be under the direction of A. S. Howell, Chief Engineer of the Bell and Howell Company, and who recently was elected to honorary life membership in the American Society of Cinematographers in recognition of his valuable contributions to the cinematographic field. This huge force of technicians will devote their time to new developments in the mechanics of the motion picture industry, whether originated within the Bell and Howell organization, or submitted to it by the industry as a whole or by individuals, says President McNabb.

The completion of this building is a real event in the cinematographic world, for no other industry requires more co-operation between manufacturer and the user of equipment than does the motion picture industry, which has in the past, and will in the future, owe most of its forward strides to the developments suggested by those responsible for the finished products—excellent film productions.

A thorough interchange of ideas is indispensable to the success of this industry which, more than any other, involves the application of science and technical knowledge.

Bell & Howell's New Engineering Laboratory, Chicago

Realizing the necessity of this co-operation, the Bell and Howell Company has spared no effort to provide it in the most efficient way. This is evidenced by the new Engineering Laboratory, and by the placing of the facilities of this laboratory at the disposal of the industry, and it is the hope of the Bell and Howell officials that in the new building advances in the motion picture development will be made that will be of untold benefit to the entire industry.

Since the advent of talking pictures many changes have been brought about in the picture industry and many new wants have been uncovered. The officials of Bell and Howell Company feel that this new building fills a long felt want which has been even more pronounced since the talkies have added new problems; and they feel that this epochal advance has, so to speak, freed the industry from the routine system and brought to its consciousness the necessity of organizing its future developments on a sound scientific and technical basis.

The wisdom of this policy has been recognized by the Bell and Howell Company since its very inception, twenty-five years ago, and has been proved by the fact that most of the motion picture standards used nowadays throughout the world have emanated from the Bell and Howell Laboratories. Also, the company has always been ready, almost upon demand, to modernize its cameras, printers, perforators, or whatever machinery was demanded by the industry, according to the exigencies brought about by the constant progress in the art.

The new Engineering Laboratory and the recognized ability of the engineering force will add considerably to the facilities that the Bell and Howell Company will be in a position to offer to the professional motion picture field.

Sound and talking pictures have opened entirely new and unlimited fields for advances in motion picture production. Color photography, wider width of film, and perhaps setreoscopic effects will be the next most striking developments which the industry will witness.

The Bell and Howell Company is ready to cope with the present situation, and is, more than ever, in a position to lead in the mechanical advances which will permit the industry to prosper, expand and fulfill its mission in both the entertainment and educational fields.

"Talkies" for the Deaf

Fear that the talkies would deprive them of the entertainment the silent drama has given them in the past, has been dispelled among deaf movie lovers with the announcement of a new device that will enable deaf persons to hear the talkies.

The new device is in the nature of earphones which plug into a special seat socket in the theater. This device was introduced in connection with the decent presentation of Filmaphone Talking Pictures at the Electric Palace, Marble Arch, England.

A special connection was made with the Filmophone device and the seats were wired. Deaf people simply asked for earphones which they plugged in on the seat. Result, all enjoyed the talkies.

Recent Releases of A. S. C. Members

"Pleasure Crazed"—Fox—Ernest Palmer and Glen MacWilliams.
"Hollywood Revue of 1929"—M-G-M—John Arnold and Max Fabian.
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"Captain Cowboy"—Bell—Paul Allen.
"The Single Standard"—M-G-M—Oliver Marsh.
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"The Awful Truth"—Pathe—David Abel.
"The Woman From Hell"—Fox—Conrad Wells.
"Big News"—Pathe—Arthur Miller.
"The Exalted Flapper"—Fox—Charles Clarke.
"The Man and the Moment"—First National—Sol Polito.
"Hardboiled Rose"—Warner Bros.—Wm. Rees.
"Midnight Daddies"—World Wide—J. W. Boyle.

Among Next Month's Features——
IN THE
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Another story from Africa by Clyde De Vinna, A. S. C.

A Royal Elephant Hunt in Siam by Jack Smith, A. S. C.

A Globe-trotting story by Len Roos, A. S. C.

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Also an article for amateurs on the use of Reflectors by Syril Dusenberry, and other technical and feature articles.

Don't fail to order your copy from your dealer today. Or, send your subscription direct to the magazine office.

Jungle

(Continued from Page 9)

tenderly lifted the girl and began massaging her back and throat to restore circulation. After a while her eyelids fluttered open. Her black eyes blinked up into the blue ones looking into hers. For a moment she seemed puzzled, the large black eyes were shaded with fear and doubt. Then they cleared and a twinkle came into them.

"Trel," she said tremulously. "Trel, you have come for me? Oh, dear, I knew you would. . . . . ."

"Yes, Kadee, I am here," replied Trel. "Never will I let you out of my sight again. Never!"

"Oh, dear, again I am so happy. When that gorilla-man took me and stole your money, I thought the end of the world had come. Now you are here with me; dear, you are not hurt?"

"No, Kadee. Do you feel better? Can you get up?"

They arose. The girl stood tottering, hanging on Trel's arms, her eyes avoiding the mangled body of the Bengal tiger.

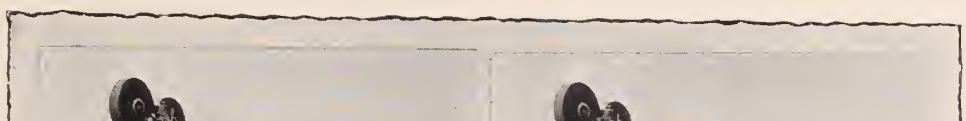
Then the giant coolie lurched to his feet and with the manner of a whipped dog, approached the white man. From head to foot he was a mass of cuts and bruises, with blood and filth matting his hairy body. At a respectful distance he stopped, put his hands to his forehead and bowed low before the white man supporting the trembling girl.

"Trel, sahib," said the coolie. "Me damn fool. Me catchum girl. Me catchum monee. Me run away. Me get killed by tiger. You save me—you catchum me life now!"

The pidgin speech ended, the coolie let his eyes wander once to the dead tiger, then stepped over and placing his huge bloody hands on Trel's shoulders, gave him a look of gratitude such as few men are privileged to see. The gesture was made in silence and all three fully understood.

Slowly the big Javanese's knees bent, then jerked straight. Pallor swept across his swarthy features. Again his knees sagged. His mouth opened, then he dropped to the ground and lay still at the white man's feet.

Silence settled down upon the jungle tragedy. Trel and the girl stood motionless, looking down at the prone form, then their eyes lifted toward the homeward trail.



What Are the Wild Waves Saying?

WE HAVEN'T the slightest idea. But here is Barry Norton, handsome young rascal, apparently trying to make believe he is both director and cinematographer. If you have one of those old-fashioned stereoscopes—the kind that used to have a place of honor in the parlor—just cut out this picture, paste it on a cardboard and put it in the "scope." The result will be a pleasant surprise. Better keep the picture as we are going to run one or two each month, and you can soon have a collection unobtainable anywhere else.

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A technical and educational publication, espousing progress and art in motion picture photography.

Suite 1222 Guaranty Bldg. - - - - Hollywood, California

Vol. X

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No. 8

FOREIGN REPRESENTATIVES

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Here are the Members Gathered at Toronto,

THE S. M. P. E. CONVENTION

As Observed by Hal Hall, Editor of The American Cinematographer

COVERING a convention of the Society of Motion Picture Engineers is not a one-man job. It took this writer just about one day to discover that. So, henceforth, and forever more, I shall never censure any writer who covers an S. M. P. E. convention for me if he happens to slip up on something of importance.

Truly, one would have to search far and near to find any group of men with such a mass of scientific brain power as one found at the convention in Toronto last month. I came away from the convention feeling as though my small brain simply never could hold all the matter it had tried to assimilate while there for four days.

It was a mavelous meeting, one which the officials of the society should be proud of. Toronto is a wonderful city and an ideal spot for conventions, and its Mayor, Samuel McBride, is to be congratulated not only on his city but for his own splendid spirit and hospitality.

Getting down to the convention details, wide film seemed to be one of the outstanding matters of real interest. The consensus of opinion seemed to be that there will be a change in the present width of film, and as for the future width, that is a problem. The society naturally voiced the opinion that a standard size should be adopted when the change is made, but no hint of any standard width was given.

Sound ran wide film a close second in discussion, and some interesting papers were read on various angles of this new picture development that has so changed the picture business.

An outstanding feature of the convention was the decision on the part of the Society to publish its own journal. This will be started in January, and will be known as the Journal of the Society of Motion Picture Engineers.

From here on I shall try to give the report of the meeting in chronological order.

Arriving at the Royal York hotel early Monday morning, October 7, I knew at once I was going to like this convention, for I ran right into Herford Tynes Cowling, head of the Eastman Teaching Films, and a member of the A. S. C. Meeting Cowling was like being wafted into a land of eternal Spring after a year in the Arctics. He radiates hospitality and within a half hour he had introduced this editor to so many celebrities that I was afraid to meet them for fear I would forget some name.

Where Cowling left off Joe Dubray, another A. S. C. member, there representing Bell & Howell, took it up, and by noon my hand felt like President Hoover's must feel after a morning of reception.

It seemed as though all the technical brains of the industry were on hand. J. I. Crabtree, C. E. Ives, O. Sandvik, Doctor Hickman, H. A. Hartt, L. A. Jones, Cowling, Ted Curtis, George Blair of the Eastman Kodak Company, and Dick Grady too, up from New York along with Charlie Bonn, of the J. E. Brulatour company. And what a great bunch!

Then there were those two National Lamp Works geniuses, R. E. Farnham and Carl Egeler, and genial President L. C. Porter. Dashing madly hither and yon, trying to do six men's work, was P. A. McGuire of the International Projector Corporation, handling the publicity for the convention. Then there were Peter Mole of the Mole-Richardson firm from Hollywood, and Frank Graves also from Hollywood, together with H. C. Silent. In rapid succession came Dr. William Rayton of Bausch and Lomb, Joe Coffman of the Audio-Cinema, W. C. Kunzman, who did a splendid job in his handling of the program arrangements, William C. Hubbard of the Cooper-Hewitt company, smiling always; W. H. Carson of the Agfa company; D. G. Blattner from the Bell Telephone Laboratories; Terry Ramsaye, Jimmie Cameron, whose book, "Motion Pictures with Sound" has, I understand, now gone into the 20,000 class in the matter of sales; William Bristol, there with a new home talkie device and Burton DePue of the Burton Holmes Laboratory and so many others that I simply cannot remember them all.

After Mayor McBride had welcomed the society to Toronto, Kunzman, Burnay, Hubbard and Crabtree gave the reports of the Program Committee, Secretary, Treasurer and Progress Committee, and Harry W. Jones gave the first paper on "The Modern News Reel," which gave an idea of what is being done in the way of making the sound better in this class of picture.

Then Dr. Hickman of the Eastman company threw a bombshell into the convention when he presented a paper on "The Present Policy of the Society of Motion Picture Engineers." It was a plea for a change in the policy of selecting officers, and created spirited discussion for nearly an hour; ending with everybody happy after expressing themselves, in some cases very emphatically.

In the afternoon S. K. Wolfe of the Electrical Research Products, gave an interesting talk on "Theatre Acoustics," in which

Canada, for the S. M. P. E. Fall Meeting

he emphasized the importance to the sound picture of proper theatre acoustics. Professor A. C. Hardy, of the Massachusetts Institute of Technology, gave a paper on "The Optics of Motion Picture Projection" which was highly technical and interesting. Rudolph Miehling's paper on "Sound Projection Yesterday, Today and Tomorrow," was an interesting talk on what has happened and will happen in the projection of sound pictures. W. H. Carson of the Agfa Ansco company followed with a discussion on "The Film Perforation and Means for its Measurement." This was followed by a paper on "Surface Treatment of Sound Film," prepared by Crabtree, Ives and Sandvik, of the Eastman company, an extract of which appears in this issue of the CINEMATOGRAPHER. "A New Method of Blocking out Splices for Sound Film," by Crabtree and Ives, followed next. An extract of this also appears elsewhere in this issue.

D. G. Blattner, of the Bell Telephone Laboratories, next gave a paper on "Characteristics of Loud Speakers for Theatre Use." At the evening session Terry Ramsaye of the Pathe Exchange, gave a paper on "The Human Equation in Sound Picture Production." This was followed by a paper on "The Sound Film Situation in Europe," by N. D. Golden, which revealed that sound abroad is so far behind us that one cannot even say it is in its infancy over there. Leon Monosson of the Amkino Corporation gave an enlightening paper on "Cinematography in Russia," and pointed out that the Russians are seriously at work and are developing much of their own in technic and equipment.

Tuesday morning Carl Gregory gave an extremely interesting paper on "The Early History of Wide Film," pointing out that wide film appeared away back in the Nineties. "Rectangle Proportions in Pictorial Composition" was next discussed by Dr. L. A. Jones of the Eastman Company. "Optical Problems of the Wide Film" came next by Dr. Rayton, of Bausch and Lomb. He pointed out the teriffic problems that the optical people face with the wide film demanding new lenses for cameras and projectors. Joe Dubray next read a paper on "Some Practical Aspects and Recommendations on Wide Film Standards" prepared by him and A. S. Howell of the Bell & Howell company. This paper created much discussion and was one of the outstanding papers of the convention. A complete extract appears elsewhere in this issue. It faced the problems coming with much useful advice.

C. A. Tuthill, of Paramount, then discussed "Wide Film from the Recording Standpoint," explaining how wide film will help sound. Joe Dubray then read a paper explaining the details of the new Filmo 16 millimeter camera which has a governor in it that makes possible many things never done before with amateur cameras. This was followed by William Bristol and a paper and demonstration of a home talking device which made a big hit. A detailed account of this appears elsewhere in this issue. Papers on "Photographic Characteristics of Sound Recording Film," by Jones and Sandvik of the Eastman Company, "Film Numbering Device for Cameras and Recorders" by M. W. Palmer of Paramount and "Dimensional Analysis as an Aide to Miniature Cinematograph," followed next. Dr. P. E. Truesdale then gave a paper, illustrated, on "Sound Films for Surgical Instruction" which proved that the cinema can be a splendid aid in teaching surgery.

Papers on developers and fixing baths by Dundon, Ballard, Crabtree and Hartt of the Eastman Company followed. There was no session in the evening.

Wednesday morning started with a paper by William Offenhauser, of R. C. A. Photophone, on "Some Fundamental Principles of Sound Recording and Reproducing." This was followed by a paper on Studio Acoustics and Microphone Placement," by J. P. Maxfield and H. C. Silent, of the Electrical Research Products, Inc. This paper brought out the advisability of using but one microphone in the studio. It also pointed out that no longer can a studio use wall-board painted to look like brick, because the acoustic properties are such that the sound will not ring true. A similar paper was next read by E. W. Kellog of the General Electric Company on "Some Aspects of Reverberation." Joe W. Coffman of the Audio-Cinema, next read a paper on "Artistic Considerations in Sound Film Production" which was enlightening and interesting as he advised that the artistic be not forgotten in the rush for sound.

"The Illusion of Sound and Picture," by John L. Cass, of R. C. A. Photophone, was next.

Thursday found the meeting in high for there were many papers yet to be read. These included "Water Cooling of Incandescent Lamps," by Dr. N. Gordon, of the General Electric; Operating Characteristics of High Intensity Arcs," by A. C. Downes and D. B. Joy of the National Carbon Company; "A Studio Photometer," by J. L. McCoy, of Westinghouse; "Flexible Drive Shafts—Their Application to Sound Pictures," by J. C. Smack, of S. S. White Dental Co.; "The Microphone Boom and Its Use," by Lew Kold, M-G-M; "A Year of Sound," by Harold B. Franklin; "Compensator for Movietone Production," by Gerald F. Rachett; "Camera Mechanisms," by A. S. Newman; "The Academy of Motion Picture Arts and Sciences," by Frank Wood; and "Camera and Projector Aperture in Relation to Sound Pictures," by Lester Cowan of the Academy. This last paper explained the new aperture standards worked out by the committee made up of members of the American Society of Cinematographers, The American Projectionist Society and the Academy. A complete excerpt of this paper appears elsewhere in this issue.

Announcement of the election of new officers, telling of the election of J. I. Crabtree, of the Eastman Kodak Company, as President, made it a complete and pleasant meeting, for Mr. Crabtree is not only a man of great mental ability, but is universally admired for his sterling character.

THE ARTISTIC POSSIBILITIES OF ACOUSTICAL CONTROL

A Common Sense and Understandable Discussion of a Vital Problem in Sound

By J. P. MAXFIELD
Electrical Research Products, Inc.

THERE is no halo about the matter of recording. It is more or less a common sense use of equipment which has been furnished. It looks more like a common sense proposition after we found out something—after we found the line to direct that common sense, than before we found that line, because other things looked to be equally common sense. The matter of holding out is due to the fact that then we didn't pick the right track on which to work out common sense.

I am stating the points I want to make with a consideration of how we observe. In taking a motion picture we are taking a scene which supposedly is something that might have happened in real life. Each individual in the audience is an observer who might have been in that scene watching it. There are two things about the talking picture that differ very markedly from the condition under which a real live normal person would observe the scene. In the first place, the camera has only one eye and people have two eyes which enables them to get a sense of depth, *i.e.*, a third dimension. The camera takes a one-eyed picture only and the art of photography has developed with the use of lighting and proper focal length of lens, and other methods you are more familiar with than I am, to indicate on the screen, a certain amount of depth.

We have a similar situation in sound. We have two ears and can determine direction and to a certain extent, depth. But the microphone is unfortunately a one-eared device and you don't get quite the same effect you would get with two ears. So we have had to make certain modifications in sound recording to take into account the fact that we are recording with one ear instead of two. There is one other point that comes up quite markedly in the talking picture that never comes up in connection with recording phonograph records, or the mere making of the records. In phonograph recording, the record is the final finished product, and if it is successful, it is an artistic product. You cannot see the artist that made the sound. There is a certain faking found to be necessary to accentuate the points of attention because you cannot see the artist. The balance of the record is not the same as you would have had if you had gone to see the artist in a theatre or auditorium.

When you come to a picture with the talking or sound track, that is no longer true. The picture, as you probably know from seeing the talking scenes run silent, is very incomplete. If you have a sound record which co-ordinates with that picture, it looks entirely different. The purpose of the sound record is to fill in the other part of the picture and round out and give an artistic effect to it.

One of the first difficulties encountered was making the voice follow the artist around the screen. Your two ears enable you to tell the general direction, but one ear completely destroys this sense. We did find that we could make the voice follow the artist in and out of the set. When a person walks back into a set, we make his voice appear to recede also, and when he comes forward, his voice can be made to appear to come forward with him. Fortunately when we controlled the acoustics we found we had done other things at the same time. For a purely psychological reason, the voice appeared to follow the artist from one side to the other, if the acoustic conditions are correct, to make if follow a speaker in and out of the set. This is probably due to the fact that when the acoustic conditions of the set are correct, the sound which is reproduced by the horn has mixed with it some of the reverberations which took place in the set. Under these conditions it is difficult to locate accurately the position of the horn behind the screen. The voice then comes from somewhere in front of the house and if you see a person on one side or the other of the screen, this makes a voice, to a good many people at least, appear to follow the speaker sidewise.

For the sake of simplicity, I am going to draw an analogy between the depth effect obtained acoustically with the microphone, and the effect of depth obtained by means of focal length of the lens where the picture is concerned. There is, however, a marked difference between the camera and the sound equipment. The focal length of the camera depends on what is built into the camera and lens, and on nothing else; whereas the "focal length" of the microphone depends upon the acoustic qualities of the set, and not upon the construction of the microphone itself. It should be remembered that the term "focal length" is applied to a microphone, so to speak, by courtesy, as the microphone itself has no physical property equivalent to the focal length of a photographic lens.

The apparent depth you hear as a speaker recedes from the camera depends almost wholly on the acoustical qualities of the set in which the action is taking place, and on the microphone position. The property by which we hear depth with one ear depends upon our ability to distinguish between the loudness of the direct sound coming from the speaker's lips as compared with the echo or reverberation that is actually in the room. Try this experiment in an empty room, having somebody speak to you from distances ranging from three to fifteen feet, while you have stopped up one ear completely. As they go away you hear an increase in the amount of reverberation. It is this change in the apparent reverberation which enables us to interpret the distance of the speaker from the camera.

There is one other thing to be mentioned here. With one ear you can no longer pay attention to a sound from a given direction to the exclusion of sounds coming from other directions. If you are carrying on a conversation with a person using both ears, you pay attention to the speaker and not to the outside noises and the incidental noises of the room. As soon as you stop up one ear you cannot do this and the noises appear to be louder and more disturbing.

Therefore, it is necessary to have less reverberation in a set than in a normal room in which you are living and using both ears. I think it was this factor of the necessary deader condition that led to the early dead sets. If the right amount of reverberation or echo is brought into the set, you immediately get one or two other effects besides this one of depth. You find that it makes very little difference whether the speaker speaks four, five, or six feet away from the microphone or eighteen or twenty feet away insofar as your ability to understand is concerned. The quality changes as it should when the person goes away. When a speaker turns his back to the microphone and speaks we get the same effect—the same change in the quality of the voice you would expect when a person turns his back to you and speaks. It is necessary, if you are going to use these changes of quality, that the speaker should turn back to the microphone if he turns back to the camera. It is necessary, therefore, that the microphone should be in the same general direction from the actors as is the camera. Otherwise, you might get the weird effect of the speaker coming to you and the voice going away from you. It is also necessary that for close-ups the microphone be located nearer to the speaker than for long shots, since a close-up is the equivalent to bringing the speaker in the near foreground.

This last requirement was not sufficiently well realized when we first started to use this new acoustic method. A very interesting result was obtained where the long-shot sound track was matched up with a close-up picture of action in the back of a set. The set was about twenty feet deep. The result was that the

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Concerning Cinematography

A Few Words From Ernst Lubitsch on Cinematic Conditions, as Told to William Stull, A. S. C.

THE cinematographers of Hollywood have had some colossal obstacles placed in their way since we began to make talking pictures, but they have surmounted them wonderfully. I think that the quality of photography they are getting now has come back almost to the high level of the old days—almost, but not entirely! There are still a few things to be overcome before we get gack that absolute perfection again; but these last few months have seen great progress.

Lubitsch and Victor Milner, His Chief Cinematographer

Probably the greatest evil has been the policy of using a number of cameras on every scene, and trying to do long-shots, close-ups, and everything else all at once. The booths have been inconvenient, but in the hands of such a skillful cinematographer as Victor Milner, A. S. C., who photographed my last picture, *The Love Parade*, they are no more than inconvenient. But the real handicap has been this business of having to use so many cameras. On silent pictures, we only used to use one camera—and that kept the cameraman busy; now, on the talkers, we have to use three or four cameras always, and sometimes more. It is entirely the wrong system; unjust to the cinematographer, to the actor, and to the director. They tell us that by using so many cameras we are saving the company time and money; well, if we are, those of us who have been making silent pictures the other way these last twenty years ought to be in jail! Just think of all the money we must have wasted by concentrating on one angle of a scene at a time—and making it good!

Just the same, this change in the camerawork of the talking films has done one good thing. It has freed the First Cinematographer from the mechanical routine of running his camera. That is good. Anyone can run a camera, but it takes a real artist to arrange the lighting so as to bring out the full beauty of the set and actors, and match the emotional key of the scene. That is a very great job in itself, and to have the first cameraman free to do this without the routine bother of cranking a camera is a very great help to a director. For myself, I do not believe in this present craze for covering a set with directors of dialogue, directors of dancing, directors of music, and all the other would-be directors who are interfering with the Director's work. I would not make a picture that way, for it could not be a satisfactory picture with so many minds trying to govern it. But to have my First Cameraman free to direct the photography is another matter. It is really what he has always been doing, and anything that gives him a chance to do his work better is just making things so much better for me. It is better too, for the company, for he can do his part better and quicker, and on the rare occasions when we have to work overtime, he can still remain to direct the photography, so that it, like the dramatic part of the picture, would be the product of a single mind's supervision. That is how things should be done in every department. That is the way it is often done in Europe. There, for instance, the director is more active in preparing and editing his pictures than is usual here; and, again, the art-director is responsible for everything about the set: one man designs it, supervises its construction, paints it, and dresses it. Our art-directors there are a much more intimate part of the production than they are here—they stay right with the picture from start to finish, even being on the set with us whi'e we are shooting, ready to make any repairs or alterations that may be needed. Over here, there is a separate man for all of these duties—a seperate mind to interpret the original design in its own way. Only once over here have I been able to have my art director work through the picture with me as we did in Europe: that was in *Lady Windermere's Fan*, a picture which I think had the most perfect sets of any I have made; and most of the critics were kind enough to agree with me on that point. So now, of course I believe in these changes which are giving the First Cameramen a freer hand in their work.

In Europe they are learning to coöperate more and more with the cinematographers. Just recently I saw a picture made by an American cameraman who has moved to Europe. Here, he was considered good, but only good, and he probably never got a real chance to do his best work; this German picture of his was much more than good, for he had been given a free hand, and the result was such great cinematography as any director would be proud to have in his pictures. But then, he had so much more to work with than we did there in Germany before I came over here. Why, I remember when we made *Gypsy Blood*, back in 1919, we had almost no facilities whatever: I don't think we had more than eight lights for the whole picture! All that has changed, but one thing is the same as ever: the American cameramen are the best in the world. How we used to envy them in the old days! They knew one thing that we would have given anything to know: they could photograph their people so that the makeup didn't show! They made pictures of *human beings* rather than *actors*. They were wonderful to us then, and they still are, for they are just as far in the lead as ever.

A striking shot of Lubitsch at work

Perhaps the greatest point about American camerawork is that it is truly artistic. It is beautiful, it is distinctive, but it doesn't call attention to itself. That is greatness in art, that it is great yet not obviously great. For when art begins to be apparent, to show itself as a definite, studied effort to be artistic, it ceases to be art, for true art needs no label. To me, that explains the greatness of American cinematography. Also, it is the key to my objection to M. Dreyer's *Passion of Joan of Arc*. That picture had brilliant moments, but it was so studied, so obviously calculated to make people gasp, and to say, "See, that is art," that it overreached itself.

Color photography? Of course it is bound to come. Right now,

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The Surface Treatment of Sound Film

By J. I. CRABTREE, OTTO SANDVIK, *and* C. C. IVES

(An Abstract from paper read at Fall Meeting of the S. M. P. E.)

SOUND record prints may be satisfactorily lubricated by applying a thin coating of a solution of paraffin wax in carbon tetrachloride along the edges of the film in the perforation area and drying. This treatment is superior to the application of solid or molten wax inasmuch as the wax does not flake off or encroach on the sound track during rewinding or projection which would produce ground noise.

The application of the wax is accomplished by means of two steel disks which dip into the wax solution. The quantity of wax applied is varied by changing the rate of rotation of the disks in relation to the speed of the film. After application the solvent is quickly evaporated by passing the film through a short narrow tube through which a current of air at 120 degrees F. is blown.

An alternative method of lubrication is to apply a 1.0% solution of light motor oil in carbon tetrachloride to the entire film surface and then buff in a manner as described previously.

In addition to providing satisfactory lubrication, it is desirable to treat sound record prints in such a manner that the film will have a minimum tendency to accumulate scratches, dirt, and finger marks during handling which in turn cause ground noise. Several suitable methods of treatment have been evolved, the most satisfactory of which consists in applying a 1% solution of cantol wax to the entire emulsion surface of the film, buffing, and edge waxing as described above. The cantol wax provides a hard smooth surface which in itself has poor lubricating properties, but the edge waxing supplies the necessary lubrication. A film treated in this manner eventually becomes scratched but the scratches are usually confined to the wax coating and do not reach down to the silver image so that by removing the wax coating at intervals by cleaning with carbon tetrachloride and re-waxing, the image is maintained clean and free from scratches.

Three machines are necessary for the above treatment, namely (a) the waxing and buffing machine, (b) the edge waxing machine, and (c) the cleaning machine. Machine (b) can be attached to the end of machine (a) but it would be inefficient to attach machine (c) to machine (a) plus (b) because the former can be run at a speed of 200 feet per minute while it would not be desirable to run machine (a) at a speed greater than 30 feet per minute unless more buffing wheels are attached.

Although in some of the experiments outlined the treated film was cleaned and retreated after projection 10 times, in practice this routine is usually not necessary, the treated film requiring cleaning only when indicated by the presence of visible dirt, oil spots, or excessive ground noise. In the case of the tests with the cantol-buffed and edge waxed sample, after projecting 130 times without further treatment of any kind the magnitude of the ground noise was only slightly greater than at the start, the projectors being kept in a very clean condition throughout the tests. This test demonstrates that it is possible to keep the projector sufficiently clean and the rewinder free from dust so that with film treated in the manner outlined no excessive ground noise is produced after 130 runs.

In the absence of the above surface waxing treatment, with newly processed prints it is imperative to either edge wax as recommended or to pass the film through a cleaning machine using a 0.5% solution of light motor oil in carbon tetrachloride. This treatment will apply a thin film of lubricating oil to the entire film surface which will assist in the prevention of the accumulation of ground noise although in view of the slightly tacky nature of the oiled surface, the film will accumulate dust and dirt more rapidly than cantol waxed film and will require cleaning much more frequently.

A. S. C. Men to South Seas

FRANK M. COTNER, A. S. C., and Guy Wilky, A. S. C., have departed for distant climes where each will spend some to considerable time. Cotner has gone to Honolulu where he is to photograph several pictures for the Hawaii Productions, of that city.

Wilky has gone to the South Seas where he will photograph a feature production which Murnan is directing for Colorart-Synchrotone productions.

High Speed Color Device

A high speed process for color photography has been developed, it is claimed by Paramount camera technicians working in conjunction with representatives of the Technicolor Corporation. The process, which makes it possible to photograph in natural colors the swiftest movements, was tested in an especially fast ballet number in "Pointed Heels."

Progress in the Motion Picture Industry

October, 1929—Report of the Progress Committee, S.M.P.E.

THE most important items of progress during the past six months have been the extensive use of all-color sound pictures, or pictures with extensive color inserts, and several demonstrations of enlarged projected pictures by the use of film wider than 35mm.

Only two-color subtractive processes are at present in vogue and in one process extensively employed, two dye images are produced in a single layer film by imbibition. Although some three color imbibition films have been prepared, they have not been publicly displayed.

To date only one type of wide film has been put on the market, this being 70mm. wide. Comment of the trade has been most enthusiastic with regard to its suitability for scenics and news events, but it is apparent that a new photographic technic is required to secure more pleasing perspective in the case of photoplays. Difficulties involved in the more universal adoption of the wide film are the present lack of standardization of size, the necessity for a greater illumination at the projector aperture, and the prevention of film buckle.

Studios in Hollywood are now producing only about 5% of silent pictures. When it is considered that only one year ago the first dramatic pictures were shown before the society, notably "The Singing Fool," the remarkable progress made since that time is apparent. There has been a steady improvement in the quality of sound reproduction, notably in the theatre, but in many cases the quality in the theatre falls far short of that which the film is capable of producing when it leaves the studio. Much still remains to be done in the way of improvement even with the best of recording. With the high quality music given by the modern radio receivers the public is realizing that the average theatre music is not equal in quality to that emanating from their radios at home.

Notable advances in studio technic have been (a) the tendency to use a minimum number of microphones and eliminate "mixing," (b) the silencing of cameras such as by means of insulating coverings thus permitting greater freedom of camera location, (c) the tendency to use more live studios so as to simulate more closely natural sounds, and (d) the non-simultaneous recording of scene and sound.

A noteworthy advance in reproducers has been the introduction of the condensor or electrostatic reproducer consisting of a rubber diaphragm coated with aluminum foil and stretched across a metal grid. Apart from the high quality resulting, the reproducer occupies no more space than the average screen and can be raised and lowered just as easily.

No fundamental advances have been made in the field of stereoscopic motion pictures and although some of the sponsors claim that their wide film processes give stereoscopic effects, they are at the most pseudo-stereoscopic. A much higher order of relief is noticeable in many of the pictures in color.

Although color pictures have been televised during the past six months, the probability of television usurping the present motion picture in the immediate future appears to be very remote.

Respectfully submitted,
J. I. Crabtree, Chairman
J. A. Ball
F. A. Benford
L. J. Buttolph
G. L. Chanier
J. W. Coffman
R. E. Farnham
G. E. Mather
R. Rogers

Quick Test to Determine Degree of Exhaustion Developer

By M. L. DUNDON, G. H. BROWN *and* J. G. CAPSTAFF
of Kodak Research Laboratories

(An Abstract of paper read at S. M. P. E. Fall Meeting)

AN EXHAUSTED borax developer not only requires a longer time of development than a fresh one but also causes an apparent loss of exposure. A similar effect is obtained by adding bromide to the fresh developer. It is suggested that the loss of exposure is caused by the solvent action of the sulfite while the start of development is being delayed by the bromide. The degree of exhaustion of developer can be quickly determined by dipping an exposed standard strip of film in the developer for a definite short time, and then immersing the strip in a solution which stops development and makes the undeveloped emulsion stable when exposed to light. Such a test has been found to be very reliable.

Camera and Projection Apertures for Sound-on-Film Pictures

By Lester Cowan
Ass't Secretary, A. M. P. A. S.

MUCH concern has been aroused among studio technicians by the fact that in some theatres the heads and feet of characters and other vital elements of the picture are being cut off in the projection of sound-on-film pictures. Projectionists are inserting in their film gates masks which mats out in addition to the sound track a portion from the top and bottom of the picture sufficient to reduce the height to about three-fourths of the reduced width. The smaller 3x4 picture is enlarged by a half inch shorter focal length lens to fill the screen. Recentering is accomplished by auxiliary devices which move the lens from right to left. Unless due allowance is made in production for this smaller aperture vital portions of the picture will almost certainly be cut out. Furthermore, in the Academy's recent survey of theatrical practice on this point, a surprising diversity of apertures was found; out of the replies of 13 of the countries major circuits, no less than nine different apertures were reported.

Probably the most difficult problem in connection with the reduced aperture method is to recenter the picture after it has been enlarged. The amount matted out from the top and bottom of the picture in reducing the aperture is calculated to balance the increased magnification so that from the standpoint of height the picture will fit into the screen frame. Magnification extends the left margin of the picture to cover about half of the blank strip. The right margin is extended an equal amount beyond the black border so that the picture must be moved to the left in order to be properly centered. Standard equipment now in use does not provide for this need. Movement of the picture from left to right is not possible due to the stationary base which gives a fixed position to the projection machine.

There are two ways in which recentering may be accomplished, both involving the use of auxiliary devices. The first and most common method of recentering is by moving the lens slightly to the left. This moves the optical centre of the lens 0.08 inches to the left, introducing spherical aberration which is sometimes noticeable on the screen, but usually not enough to be considered a defect. An "Ilex" lens has been developed with optical corrections permitting sharp definition at two focal lengths, thus simplifying the procedure by eliminating the necessity of actual lens changing. The second method of recentering is by the use of a device which makes it possible to move the equipment on a horizontal plane. The newest development which promises a satisfactory solution to the problem is a shifting device developed by the Bell Laboratories. The shifting device consists primarily of these two units: a pivot-plate for the forward pair of legs, and a plate incorporating a pedal mechanism for the rear pair of legs. Provisions are made for anchoring the footpads of the reproducer set to these units, which are in turn bolted securely to the floor. By proper adjustment of the stop screws on the pedal mechanism a full-sized picture is centered by depressing the right-hand pedal until further motion is halted by the adjustable stop, and the smaller picture is centered by depressing the left-hand pedal. The locking device, which consists of a quick-release screw clamp, maintains either position and assures the picture remaining centered.

Studio Practices

Twelve studios reported in the Academy survey. All were making allowance in photography for the sound track either through a definite marking on the camera ground glass or through instructions to cameramen to centre their pictures to the right so that the addition of sound track would not affect their composition. Two of the studios—who had been in communication with their own theatre chains, were informed of the new practices and accordingly had markings put on their camera ground glasses delineating a smaller rectangle within which all action was to be photographed. The pictures photographed within these new ground glass markings did not suffer from the reduced aperture practice.

Most of the studios, however, did nothing to anticipate the new theatre methods, and it is also interesting to note that twelve studios reported twelve different markings on their ground glasses. This is partly explained by the fact that some studios have had the sound track width indicated by a line on the ground glass, while others simply instructed cameramen to center their compositions to the right so as to make room for the sound track.

When the cameraman looks into his ground glass he must bear in mind that the picture which he is composing is likely to be projected through apertures of three different sizes:

1. Movietone—0.650-in.x0.820-in. (approximately).
2. Reduced aperture—0.600in.x0.800-in. (approximately).
3. Standard, for silent and disc release—0.680-in.x0.906-in. (approximately).

The picture must look well in all three forms. The practice of most cameramen is to favor the reduced Movietone apertures by centering their picture a bit to the right. A properly composed picture will confine the action within the smaller area with a suitable background and foreground for theatres using the Movietone or Standard apertures. If any of the three forms suffers it will most likely be the picture for silent or disc release.

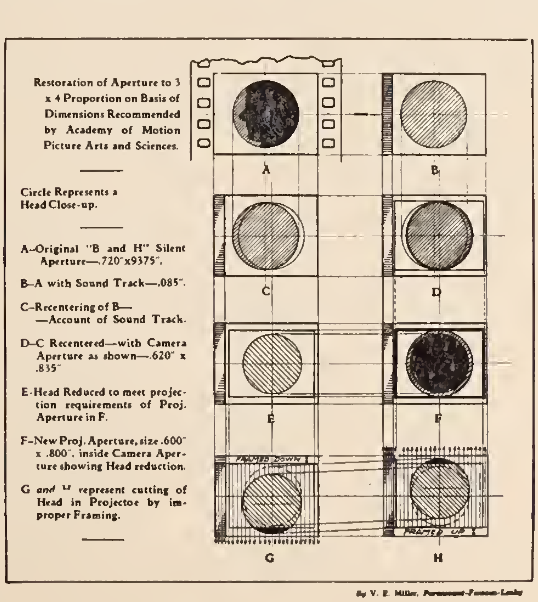
In this connection a comment made at a recent Academy meeting is interesting:

"There is a way, I think, whereby we can satisfy both silent picture exhibitor and the sound picture exhibitor, giving them both an identical composition in the 3x4 ratio. The method is just the reverse of what Photophone did when they first began. The method is to take the picture in the camera on a smaller size, masking off the rest of the film, then printing the release for the sound version in the usual manner and printing the release for the silent version on optical printers. Such a printer is being used back in New York. ***At one time, nobody knew how to do optical printing, but with all the skill there is in this business, it could be done."

The facts above were presented at a joint meeting of the Technicians' Branch of the Academy of Motion Picture Arts and Sciences with the American Society of Cinematographers and the local chapters of the Society of Motion Picture Engineers and the American Projection Society. After an extended discussion the meeting decided to refer the survey data to a joint committee composed of representatives of the four organizations.

At a second joint meeting of these four societies the joint committee reported back the recommendations embodied in the following resolution, which was adopted by a unanimous vote of the four societies:

WHEREAS, investigation has revealed wide variance in theatre projection practices and that there is no effective standard aper-



By V. E. Miller, Paramount-Famous-Lasky

Diagram illustrating aperture changes proposed

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SOME PROPERTIES OF FIXING BATHS

Part Two of an Unusually Interesting and Informative Paper Presented at Spring Meeting of S. M. P. E. at New York City, May 6-9, 1929

By J. I. CRABTREE *and* H. A. HARTT

Second part of Communication No. 396 from the Kodak Research Laboratories, Rochester, N. Y., will be published in three parts. The final installment will appear in the December issue.—EDITOR'S NOTE.

POTASSIUM and chromium alum are the most desirable hardening agents for use in an acid fixing bath, but the present discussion will be confined exclusively to the hardening properties of fixing baths compounded with potassium alum.

At the outset, it was considered that a fixing bath formula might be compounded by merely determining (a) the quantity of alum necessary to produce satisfactory hardening, (b) the quantity of acid necessary to prevent the precipitation of aluminium sulfite on the addition of a given quantity of developer to the alum solution, and (c) the quantity of sulfite which it was necessary to add to this mixture to prevent the precipitation of sulfur from the hypo in the presence of the acid.

Preliminary experiments indicated, however, that the hardening produced by a fixing bath was not merely a function of the alum or acid content, but was determined by the relation between the concentration of acid, sulfite, and alum and was independent of the quantity of hypo. Therefore, in order to determine the correct proportion of the various constituents to produce an acid hardening fixing bath having any desired properties, it was necessary to study the effect of each constituent in the presence of varying proportions of the other two constituents.

In Fig. 3, the full line represents the progress of hardening on the addition of sodium sulfite to a bath containing 0.5% alum, 1.0% acetic acid, and 30% hypo. The "dash" line represents the tendency of such a bath to precipitate sulfur with various concentrations of sulfite, while the "dash and dot" line indicates the tendency of the bath to precipitate aluminium sulfite with increasing additions of sulfite. The last two curves are plotted in terms of days of storage at 115° F., as indicated on the right hand side of the chart.

Figs. 4 and 5 represent a multiple set of curves corresponding to those shown in Fig. 3 for fixing baths containing 0.5% and 1.0% of potassium alum, varying concentrations of acetic acid (0.5 to 3.0%), and increasing concentrations of sulfite.

1. *Factors Influencing the Hardening Properties of Potassium*

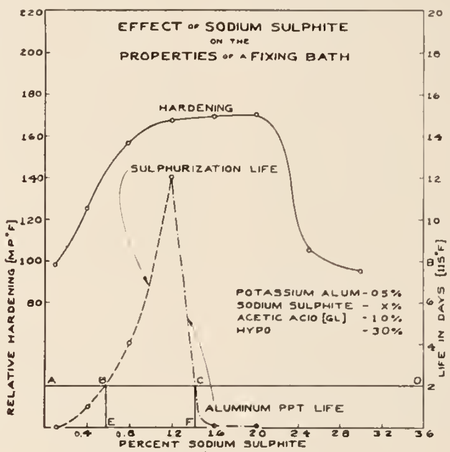


Fig. 3. Effect of the addition of sodium sulfite to a fixing bath on (a) the hardening properties, (b) the sulfurization life, and (c) the aluminium precipitation life.

Alum Fixing Baths

From a study of Figs. 3, 4, and 5, it is seen that (1) the hardening produced is a function of the relative proportion of the acetic acid, sodium sulfite, and potassium alum; (2) for given quantities of sulfite and alum the hardening decreases as the concentration of acid increases; (3) for given quantities of acid and alum the hardening increases to a maximum with increasing concentration of sulfite after which the hardening decreases, that is, there is a critical quantity of sulfite for each concentration of acid which gives maximum hardening; (4) the maximum hardening produced in any case increases when the concentration of alum is increased; (5) in any particular case, the maximum hardening obtainable with a given concentration of alum decreases as the concentration of acid increases. The decrease is not appreciable with acid concentrations below 2.0%, but it is more marked as the acid concentration is increased above this quantity.

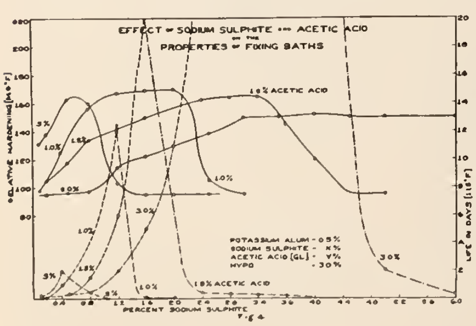
The effect of temperature on the hardening produced by a fixing bath is shown in Fig. 6, which indicates that the hardening increases slightly as the temperature of the fixing bath increases. The time of fixation also affects the hardening produced as indicated by Fig. 7. The age of a potassium alum-acetic acid fixing bath previous to use, has little or no effect on hardening properties as is likewise shown by Fig. 7. The quantity of alkali in the film when placed in the fixing bath also affects the hardening produced as indicated by the following table:

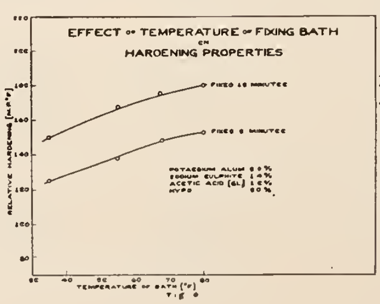
Table II

Effect of Time of Rinse Between Development and Fixation on Hardening Properties of a Fixing Bath

Time of Rinse	Rel. Hardening (M. P. °F.)
0.0 min.	170°F.
0.5 "	185°F.
1.0 "	186°F.
2.0 "	188°F.
5.0 "	190°F.

2. *Factors Influencing the Sulfurization Life*—From the





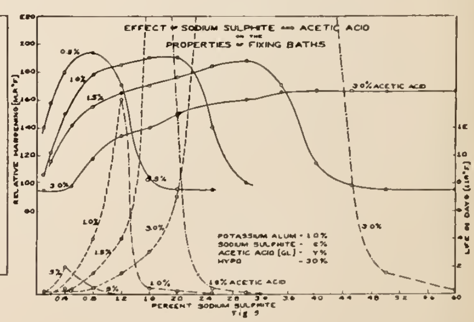


Fig. 4. Effect of the addition of sodium sulfite and acetic acid on the properties of a fixing bath containing 0.5% potassium alum. Fig. 5. Effect of the addition of same chemicals to a bath containing 1.0% potassium alum. Fig. 6. Effect of temperature of a fixing bath on its hardening properties.

curves shown in Figs. 3, 4, and 5, it is seen that (a) for equal concentrations of alum and acid, the sulfurization life increases rapidly as the quantity of sulfite increases, the sulfurization life apparently increasing logarithmically with the concentration of sulfite; (b) for equal concentration of alum and sulfite, the sulfurization life decreases as the concentration of acid is increased; (c) for equal concentrations of acid and sulfite the sulfurization life decreases only slightly with increasing concentration of alum.

3. *Factors Affecting the Developer Capacity*—In order to determine the developer capacity (the quantity of developer which can be added to the fixing bath before precipitation of aluminium sulfite occurs) for all of the formulas represented by the various points in the curves shown in Figs. 3, 4, and 5, it would have been necessary to prepare a large quantity of these formulas and determine the quantity of developer necessary to precipitate aluminium sulfite in each case. It was considered desirable, therefore, to find a method whereby the curves already obtained could be interpreted in terms of "developer capacity." Curves 3, 4, and 5 show that with an increasing quantity of sulfite there is a tendency to precipitate aluminium sulfite, while with an insufficient quantity of sulfite, sulfur tends to precipitate. It is between these two limits that a suitable stable fixing bath exists; in other words, there is a definite quantity of sulfite which may be added to any given formula which is satisfactory with regard to sulfurization life before the precipitation of aluminium sulfite occurs. It was thought that it might be possible to find a definite relation between this quantity of sulfite and the quantity of developer which would cause similar precipitation. Experiments were therefore made to determine this relation by comparing the quantity of developer in one case, and the quantity of sulfite in the other case necessary to precipitate aluminium sulfite in the case of typical formulas. The formulas tested were so chosen that the sulfurization life was equal in all cases. The following table gives the results of these experiments:

Table III

The Relative Effect of Developer (MQ 25) and Sodium Sulfite on the Precipitation of Aluminium Sulfite in a Fixing Bath

	% Sodium Sulfite to Cause Precipitate		% MQ 25 to Cause Precipitate		Ratio MQ 25 Sod. Sulfite		Composition of Bath			
	70°F.	115°F.	70°F.	115°F.			% Potassium Alum	% Sodium Sulfite	% Acetic Acid	% Hypo
1.	4.6	1.0	30	7	6.5	7.0	1.5	1.2	1.5	30
2.	5.5	2.6	36	20	6.6	7.7	1.5	3.0	1.6	30
3.	2.4	1.4	15	8	6.3	5.7	1.0	1.0	1.5	30
4.	5.0	5.1	40	34	8.0	6.7	0.5	1.5	3.0	30
5.	1.7	3.8	14	22	8.2	5.8	3.0	2.6	3.0	30
				Average	7.1	6.6				

These results show that although the relation is not constant the results are sufficiently uniform to permit their use in determining the relative developer capacity from the curves in Figs. 4 and 5. It is considered that the ratio of approximately 1:6 is permissible; that is, for 1.0% sodium sulfite, which may be added to a given formula before precipitation of aluminium sulfite occurs, 6.0% of MQ 25 developer may be added before a similar precipitate will be formed. In applying these results to developers other than MQ 25 it is necessary to know the alkali and sulfite content of the developer in relation to that of MQ-25 developer.

From the curves (Figs. 4 and 5) it is seen that (a) for equal concentrations of alum and acid the developer capacity decreases with an increased quantity of sulfite; (b) for equal quantities of sulfite and alum the developer capacity increases as the concentration of acetic acid increases; (c) for equal quantities of sulfite and acid the developer capacity is only slightly affected by an increased concentration of alum.

4. *The Application of Hardening Curves to the Preparation of Fixing Baths Having Required Properties.*—From the curves (Figs. 3, 4 and 5) it is possible to compound a fixing bath having any given properties. The following three factors must be known before a suitable fixng bath may be compounded: (a) the hardening desired: (b) the developer capacity, and (c) the sulfurization life. With this information available, the series of curves (Figs. 3, 4, and 5) which gives the maximum hardening desired is selected and from these curves the necessary quantity of alum is determined. Then, by drawing a line parallel with the sodium sulfite axis at a distance from it representing the desired sulfurization life as indicated on the axis "life in days," and determining the limits of the sulfite content between the sulfurization and aluminium precipitation curves, the quantity of acid necessary is indicated by the curves whose sulfite limits correspond to one-sixth of the developer life desired. Then, by projecting the point of interesection of this parallell line and the sulfurization life curve to the sodium sulfite axis, the quantity of sulfite sufficient to give the necessary sulfurization life is indicated. This gives the complete hardening formula, which may be added to a quantity of hypo as determined by the amount of film to be fixed and the rate of fixation desired.

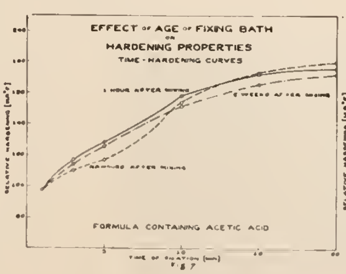
5. *Example of Use of Curves in Compounding a Fixing Bath Formula*—If it is desired to compound a fixing bath having the following properties; relative hardening 160°F., sulfurization life 2 days (110°F.), developer capacity 6% MQ 25, proceed as follows:

It is seen from Fig. 3 that the maximum hardening produced by an 0.5% potassium alum solution with varying concentrations of sodium sulfite is approximately 160°F. Draw a line parallel with the sodium sulfite axis at a distance from it represented by two days on the sulfurization life curve at B and the aluminium precipitation curve at C. Project the points B and C to the sodium sulfite axis to the points E and F, respectively. The difference in the sodium sulfite concentration represented by these two points multiplied by 6 gives the relative developer capacity for the acidity (1.0%), which is represented by these curves; that is, 1.5%—0.6%=0.9%; 0.9%X6=5.4% equivalent developer capacity. The quantity of sulfite represented by point E (0.6%) is the quantity necessary to give the desired (2 days) sulfurization life. This information gives the proportion of the various ingredients (0.5% potassium alum, 0.6% sodium sulfite, 1.0% acetic acid) required to produce a fixing bath having the above desired properties. This hardener may then be added to a given hypo solution and the fixing bath is then complete.

Fig.3 was used for the above example merely for the purpose of simplicity. In order to compound fixing baths having properties other than the above it is necessary to refer to Figs. 4 and 5 or additional sets of curves for other concentrations of alum.

In choosing the alum concentration, the minimum quantity which will give the necessary hardening is desirable. The quantity of sulfite to insure the necessary sulfurization life (x days at 115°F) is then determined as indicated above. The quantity of acid is decided upon by finding the set of curves (aluminium precipitation life and sulfurization life, such that the space between them at a distance of two days* from the sulfite axis corresponds to one-sixth of the developer capacity. The acid concentration represented by this chosen set of curves gives the acid concentration to use in the formula. With this fixing bath it is therefore possible to add a quantity of sulfite x (as represented by a developer life of 6x) in addition to that already present in the formula before a precipitate of aluminium sulfite is formed.

The formula given above represents a suitable stable acid hardening fixing bath which might be used in cases where only a relatively small quantity of developer is carried into the fixing bath. Fig. 8 shows the effect of the addition of developer on the hardening properties of this formula. It is seen that the hardening at first is not as high as desired, but with the addition of further developer (about 5% MQ 25) the hardening falls off and the bath is rendered useless by the formation of a precipitate.



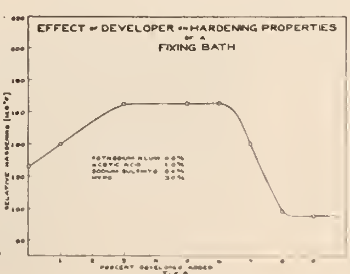


Fig. 7. Effect of age of fixing bath on its hardening properties. Fig. 8. Effect of the addition of developer on the hardening properties of a fixing bath.

(Continued on Page 40)

As the Editor Sees It

Home vs. Theatre

GILBERT SELDES in *Film Daily* brings up a point that should be food for thought to those in the picture business. It is the idea that within the next year and a half the talkies will find themselves face to face with the home-talkie with a result that bodes ill for the theatre talkies. He brings forward the statement that the talkies will have to improve or they will be hard hit by these home-talkies.

Mr. Seldes has his ear to the ground and his finger on the public pulse when he speaks and picture producers would do well to heed his warning. It doesn't take the brains of a mental giant to figure out that as a whole the stories have been sacrificed for the talkies. And this is exactly what is going to harm them.

Men and women throughout the nation have now become accustomed to the talkie. It is no longer a novelty to hear a voice from the screen. But how long can we expect them to be dragged into the theatres for novelty alone?

The silent films had been brought up to a high point in story form and cinematographic artistry just before the talkies hit us. It took years to do it. Then cinematographic artistry and story were tossed overboard in the mad scramble to produce a bigger noise than the other fellow. The idea of entertainment seems to have been forgotten except in occasional pictures. A little child can be entertained with a rattle or a drum or any kind of noise. However, the public has grown up in sound and something more than a din must be given or disaster is ahead.

Masters of the cinematographic art have little opportunity to use that art because microphones must come before art. The cinematographers still are as clever as ever, but they have little chance to prove it. It will be for the betterment of the entire industry if the picture makers realize the situation before it is too late, and give us back story and photographic beauty.

S. M. P. E.

YE EDITOR had the pleasure of attending the fall meeting of the Society of Motion Picture Engineers at Toronto last month, and takes the opportunity to say that it was truly an inspiration.

While sitting there at one of the sessions the thought came to the writer that it is too bad that the picture makers as a whole do not take a leaf out of the notebook of the S. M. P. E. and —8—CINEMATOGRAPHER 7613 .... Mac give more effort to achieving something of value to the industry and less to politics.

Relatives and studio politics are the two curses of the picture industry. And while the people who seek publicity and positions for relatives and friends are playing politics, these Engineers are quietly effacing self and in the laboratories and elsewhere are consistently producing the marvelous technical improvements that make our pictures the world's best. To be present at one of their conventions is an inspiration.

Shoes or Art?

THE foreign situation as far as American films are concerned causes one to wonder just what is the real reason the peoples of lands across the seas try to make importations of our films so difficult.

You hear various reasons advanced by those who put up the film bars. They say they do not want to stifle their own picture art and business and what not. But, to a casual observer sitting on the sidelines the though persists that art and pictures, for that matter, have much less to do with it than automobiles, shoes and other articles of a commercial nature. From various sources the information has been trickling in to the effect that American films have increased the sale of American autos and clothing abroad. In fact, it has been rumored that one British firm, after spending much money on the development of shoes, had to spend an equal amount changing their lasts because American shoes on the screen had caught the fancy of the British public. So, after all, it may be shoes that pinch and not art.

Christmas Seals

AS YULETIDE approaches we again see the familiar Christmas seals. Little stamps costing us but a trifle, but with a result that is wonderful. Every seal sold means another blow at the dread tuberculosis disease. Let's all buy more this year and help a good fight.

Eastman—Brulatour

IN HOLLYWOOD the two names—Eastman and Brulatour—are synonymous with service and cheerful coöperation. Genial Eddie Blackburn, head of the Hollywood branch of the J. E. Brulatour company, together with Emery Huse and the entire staff, are the soul of service and make one feel glad to do business with their firm.

While on his recent trip to the S. M. P. E. convention this writer was fortunate enough to meet a big group of the Eastman men from Rochester. It seemed as though the writer had never left Hollywood, for the same splendid atmosphere surrounded the Rochester group. Ted Curtis, George Blair, Cowling, Crabtree, Sandvik, and all the others. Then at Rochester, where the writer stopped off for a couple of days, the same spirit prevailed—a spirit of helpfulness and cordiality—service.

Finally, in New York at the Brulatour office the same spirit again—J. E. Brulatour himself, Bill German and Charlie Bonn, all really happy in making other people happy. No wonder the Eastman company and Brulatour are a success.

Congratulations

THE second number of the new magazine, "Projection Engineering," has just reached this editor's desk, and he takes this opportunity to compliment the Byron Davis Publishing Co., and Mr. M. L. Muhleman, editor.

This new magazine is a publication anyone should be proud of, and one which no projectionist can afford to be without. Real information of worth and merit is contained in its pages and even a casual perusal could hardly fail to give the reader much excellent information, while careful study makes it invaluable.

The American Cinematographer takes real pleasure in welcoming this magazine and it is our hope that it will continue to grow and prosper.

Thanksgiving

ONLY a comparatively few more days and we will be observing Thanksgiving again. I wonder how many of us will give the day a thought other than that it is a time when most of us eat turkey!

The other day I was walking down Hollywood boulevard when I saw a man struggling along the sidewalk somewhat after the manner of a crab. Poor devil, he had no legs. They were gone from his hips. On his hands were a pair of leather pads. He dragged himself along with these. On his back was a bag of pencils. And on his face was a SMILE. Business was good and he was happy.

The thought hit me that most of us should take stock of ourselves and the blessings of health that are ours, and that perhaps most of us, who have forgotten how to pray, should get down on our knees on Thanksgiving Day and thank God that we are even alive.

Criticism

DURING the past seven months revolutionary changes have taken place in the AMERICAN CINEMATOGRAPHER magazine. Fiction, features, amateur articles have been introduced. The cover policy has been changed and, in general, the entire make-up of this magazine has been done over.

We have received much favorable comment from various quarters and, naturally, some adverse criticism from some sources. However, the world is changing continually. If it didn't we would still be traveling in stage coaches. We would like to hear more from our readers regarding their reactions. After all, this is your magazine and it is our aim to make it the greatest interest to you. Suggestions and criticism will be welcomed as gladly as praise. So give us your reaction.


ASC
AMERICAN CINEMATOGRAPHER
CINEMATOGRAPHIC ANNUAL
FOR TEN YEARS THE AMERICAN CINEMATOGRAPHER HAS BEEN
ENRICHING THE ENTIRE MOTION PICTURE WORLD WITH THE WISDOM
ACCUMULATED THROUGH THE WIDE EXPERIENCES OF IT'S MEMBERS
OUT OF THIS SHALL ARISE AN INSPIRED
CINEMATOGRAPHY WHICH SHALL BRING ABOUT IN GOOD TIME
A BIGGER AND BETTER CINEMA
GLENN R. KERSHNER
A.S.C.

A. S. C. Research Committee Completes Make-up Tests

AT THE regular October Meeting of the American Society of Cinematographers, the Research and Educational Committee, headed by Victor Milner, A. S. C., presented the results of its recent series of make-up tests. These tests are as a result of the general adaption of Incandescent lighting and Panchromatic films for studio production, and directly continue the famous Mazda Light Tests made by the A. S. C. in April, 1928. At that time, the need of an entirely new range of make-up materials was clearly shown, but due to the sudden advent of such amazing technical innovations as sound, natural-color cinematography, and wide-film, no concerted study of make-up was possible.

The need, however, still existed, and was met by the development of an entire new line of cosmetics, termed Panchromatic Make-up. This is a complete range of make-up, every shade being a perfectly balanced blend of colors from the entire range of the spectrum, so blended as to create a beautiful flesh tone, which photographs practically the same under any style of lighting—incandescent, arc, or sunlight. The color components are so balanced that no matter what style of lighting is used, there is always a satisfactory balance of color, preventing the 'washed out' appearance so often noticed with the old style make-up. Furthermore, in this new line of cosmetics, the entire scale, from the lightest numbers to the darkest, maintain the same balance, eliminating the necessity of making separate tests of a subject each time the make-up is changed. The photographic values of the whole line are constant, and, as the steps by which the new colors are graded are in all cases alike, one need simply specify a make-up one, two or more shades lighter or darker than the one in question, and the problem will be solved.

Moreover, this gradation is preserved not only in the grease-paints, but in the lining, lip-rouge, and powders as well. The lining-colors and lip-rouges maintain the same desirable photographic balance that the grease-paints do, while the powders are chromatically identical with their corresponding grease-paints. This last is truly an important development, for as most actors habitually powder immediately before each scene, with the old-style of make-up they progressively lightened their faces until by the end of the day they were entirely different from the original make-up; now, however, this continual powdering has no such effect, as the powder is an exact chromatic duplicate of the underlying grease-paint.

The tests made by the Reserch Committee were made at the Tec-Art Studio, under as nearly as possible the same conditions met with in regular production. Strictly standard equipment was used throughout. The lighting was arranged with little attempt at modeling, and was practically identical throughout the entire series of tests. The subjects were chosen less for beauty than for the opportunities they offered for corrective make-up. In all cases the tests included identical views of the subject without make-up, with the old style, and with the new Panchromatic makeup; also, in some cases, direct comparisons of any two of these. The resulting films were processed under standard conditions, and as nearly uniformly as possible. Thus these tests very closely represent actual production conditions throughout, and as such they form a most valuable reference work on the subject of modern cinematographic make-up. Furthermore, the Research Sommittee, in coöperation with the Factor organization, is devising a convenient quick-reference make-up chart with which all A. S. C. members will soon be supplied, and is also coöperating in experiments looking toward the standardization of make-ups for natural color cinematography. These latter experiments are still proceeding, and their results will be announced in due time.

Coaching Football With Movies

THE movies have been growing increasingly familiar in College classrooms of late, and now Chick Meehan, famous coach of N. Y. U.'s football teams, has added them to his coaching staff. Pathe news has agreed to supply him with special prints of their films of each of his team's games, an arrangement which will be of great value in studying and improving the work of individual players.

Rosher with Glyn

London—Elinor Glyn is making her first talking picture at the British International Pictures' studio. Charles Rosher, A. S. C., is to direct the photography.

Benoit, A. S. C., in France

IS THE French cinema at last beginning to understand its resources? We have commented many times how much it would profit by turning aside from the worldly intrigues and society dramas to reflect more exactly the simple life, to clear the mind of human ills. The brutal, tragic Russian cinema and the touching sincerity of the young American school bring valuable lessons. But there are some among us who appear to be striving for similar effects.

Messrs. Jager-Schmidt and Georges Benoit, A. S. C., have just made a film entitled *Fumes*, in which the action takes place in the setting of the mines, and has for its hero a rough man and a melancholy young girl, individuals who are unknown to us and to themselves.

Fumes, whose title alone indicates its unique character, will undoubtedly be one of the important productions of the coming season. It is interesting from many angles, and the conditions under which it was made are exemplary. All of the shooting took place at Bruay-en-Artois; it is probably the first time that a film of such magnitude has been made in the North country, and that, we think, is indicative of possible future activity in that district which is so far from lacking in cinematic locations.

"We reached Bruay, August 11," I was told, "and the last scenes will be made about September fifteenth. We have had the great advantage of being able to make on the same spot both our exteriors and interiors. The apparatus, lights, etc., not being conveniently taken down into the mine, we put up in front of the old Bruay casino, a gallery fifty metres long, exactly duplicating those below, with its rails, tramway, turntables, telephone communication—a real marvel, from the plans of M. Becq, a young mining engineer. Messrs. Jager-Schmidt and Benoit have made all the scenes there of the work in the mine, and even staged a flood which gave a perfect illusion of actuality.

"As for the other scenes, as you see, we have used the actual settings of the village and mines. The mine is our principal collaborator, and we have found the population very intelligent and picturesque types, such as those who play Cafougnette and the barmaid Simone Landreau, adding again to the truthful atmosphere of the picture.

"The interiors have been made with the same convenience, as the Nord-Film Company has brought to Bruay a regular studio with a capacity of 200,000 cp. and can on this score rival the Parisian studios. We have here actually three sets: the main room of an inn, an interior of a miner's house, and the office of a mining engineer. This magnificent organization has saved much valuable time."

The scenario of *Fumes* was adapted by M. Jager-Schmidt from a novel by Bupuy Mazuel, the author of *The Miracle of the Wolves*. The directors are not unknown. M. Jager-Schmidt was a noted journalist and is a very popular dramatist. We owe him notably *Charley*, *Fredaine's Marriage*, *The French Doll*, and now *The Fortunate Family*, which will be produced at the Odeon theatre during the coming season. His technical collaborator, M. Georges Benoit is a man who deeply understands his craft, having spent nearly twenty years in America, in the studios of Hollywood.

"The shooting will be finished in a few days," I was told, "and the directors expect to complete the editing fairly quickly. Then the film will be shown by the end of November in one of the great theatres on the Boulevards."

I left Bruay with optimism. All the elements material and intellectual had been joined to make *Fumes* a great film. It remained only for Messrs. Jager-Schmidt and Georges Benoit to prove to us their skill as cinematic artists.

PIERRE LEPROHON, in *Cinemonde*

ALVIN WYKOFF, A. S. C., president of the local No. 659, I. A. T. S. E., snapped while on location shooting "Out to Kill," starring Joseph Schildkraut. John Robertson is standing behind him.

Cameraman's Work Doubled

ADDITION of spoken dialogue to the screen has doubled the work of cameramen, according to George Folsey, A. S. C. head cameraman at Paramount's Long Island studio.

"Just as on the stage, dramatic dialogue calls for a variable 'mood' lighting, so the talking picture presents the same problem, but to even a greater extent," says Folsey. "The inflection of the voice of the actor or actress determines, many times, the camera angle and the degree of light.

"Then, of course," he continues, "working in sound-proof boxes, the position of our camera inside that confined space must be determined with an almost mathematical degree of certainty. Our men must be trained and rehearsed to handle the lights necessary for a scene before the action takes place, and must be able to work in perfect silence.

"The microphone itself has added another new problem. We must know when to shoot under or over one. That presents still another angle of shooting which must be taken into consideration. Then the microphone must be placed in proper position, either on the floor, suspended overhead, or even hidden in a piece of scenery.

"Lighting for scenes follows inflections of the voices, their tone and quality, and the general theme of the dialogue."

Method of Testing for Presence of Sodium Thiosulfate in Motion Picture Films

By J. I. CRABTREE *and* J. F. ROSS
of Kodak Research Laboratories

(An Abstract of paper read at S. M. P. E. Fall Meeting)

A METHOD of testing for the presence of sodium thiosulfate in motion picture film has been worked out which consists of placing strips of processed films in a mercuric chloride-potassium bromide solution. If the film contains an appreciable quantity of sodium thiosulfate the solution becomes opalescent, the turbidity being roughly proportional to the quantity of hypo present. It is possible to detect the presence of 0.05 milligrams of sodium thiosulfate (crystals) in motion picture film by this test.

Some of the factors which determine the rate of fading of silver images have been outlined and the critical hypo content and degree of washing necessary with negative and positive motion picture film to insure stability have been indicated.

Under ideal conditions it is necessary to wash thoroughly fixed motion picture negative film for 30 minutes and motion picture positive film for 20 minutes in order to eliminate the hypo. Under practical conditions the times are greater according as the conditions differ from the ideal.

Properties of Chrome Alum Fixing Baths and Stop Baths

By J. I. CRABTREE *and* H. A. HARTT
of Kodak Research Laboratories

(An Abstract of paper read at S. M. P. E. Fall Meeting)

A DISCUSSION of the factors which control the hardening action of chrome alum solutions when compounded in stop baths and fixing baths. Suitable formulas are given and the behavior of a recommended stop bath and fixing bath on exhaustion is dealt with in detail.

The hardening properties of a chrome alum solution are very sensitive to slight changes in acidity so that during use as the acid in the fixing bath or stop bath is neutralized by the alkali in the developer carried over by the film, the transition from a hardening to a non-hardening condition is very abrupt. The hardening properties of a chrome alum fixing bath likewise diminish with age even without use and this is attributed to the formation of a green chromium complex which does not harden the gelatin film. Chrome alum baths are especially suitable for high temperature work when excessive hardening is desirable, but for work at normal temperatures potassium alum baths are to be preferred because they harden the gelatin to a less degree, they do not lose their hardening properties on standing without use, while they retain their hardening properties for a longer period during use and without revival.

What Next?

Manchuli, Manchuria—What are said to be the first sound pictures taken in front line trenches, were filmed here recently when three American cameramen shot scenes of sporadic fighting between Russians and Chinese.

R-K-O Sound Studio Growth

EXPANSION program involving the expenditure of more than $2,500,000 and providing for the erection of what company officials say will be the largest sound stage building in the world when completed is being planned by R-K-O. The plan is to utilize every square foot of the 12 acres of ground owned by the studio.

Ground will be broken during the next few weeks on the new sound-stage building which will be 500 by 150 feet and contain facilities for the making of four talking pictures at one time. R-K-O will be equipped to film as many as 13 pictures simultaneously. Construction already has started on the new administration building and work is scheduled to begin this week on the rehearsal building.

Other projects called for include the erection of a studio restaurant with a capacity of 250 persons, a new system for the transportation of sets from stage to stage and a sprinkler system operating in every building in the studio.

Color Helps Stage Players

USE of color in pictures in the next two years will bring a great number of players from the legitimate stage who had failed in black and white camera tests, Dr. Herbert T. Kalmus, president of Technicolor, predicts.

"Recent improvements in the technicolor process have made it possible to reproduce flesh tints accurately and the exact color of hair and eyes," Kalmus says. "While this is not of so much importance in photographing men, it is vital in presenting women on the screen. Now, when you see a close-up of an actress in color, you see her exactly as she would appear on the stage, from a seat in the front row. Beauty is not so much contour of face as it is coloring and at last the motion picture producer is able to give you his stars exactly as they appear in the flesh."

The Optical Problems of Wide Film Motion Pictures

By W. B. RAYTON
Bausch and Lomb Optical Company

(An Abstract of a Paper read at the Fall meeting of the S. M. P. E.)

THE motion picture industry seems to be about to adopt film wider than the standard 35 mm. film now in universal use. Such a step imposes very grave burdens on the optical systems required for photography and projection. Both in photography and in projection, lenses have been called for which while maintaining the high speed and fine definition necessary for the conditions in the studios and theatres must cover hitherto unrealized fields of view. In projection the question of illumination bristles with difficulties.

The Bausch and Lomb Optical Company has been cooperating with the sponsors of wide film motion pictures by designing the new lenses involved. New photographic lenses which cover a picture area 23x46 mm. at a speed of f:2.3 in focal lengths as short as 50 mm.; new projection lenses which will project, with beautiful definition, pictures of this size in focal lengths as short as 3 inches; and new condensers to bring the brightness of the projected picture up to a satisfactory level have been perfected.

New Method of Blocking Out Splices in Sound Film

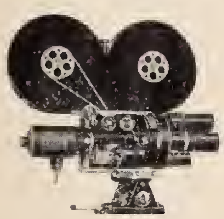
By J. I. CRABTREE *and* C. E. IVES *of Kodak Research Laboratories*

(An Abstract of paper read at Fall meeting of S. M. P. E.)

WHEN two pieces of motion picture film bearing photographic sound records are spliced together end to end an irregularity in the opacity is introduced at the point of junction. This irregularity is abrupt and causes a sudden change in the light transmitted by the film passing the light sensitive element of the sound reproducing device. Therefore, unless some means is utilized for gradually masking off the entire width of sound record in the vicinity of the splice a foreign noise is heard when this part of the record is reproduced in a theatre. One means of masking this area is by applying ink or black lacquer to the film with a brush in a triangular area covering at its widest part the splice in the film sound record. This brush work is slow and difficult to accomplish and the results are often unsatisfactory.

A much simpler and quicker method of rendering the required area opaque has been devised. A patch made of thin black film is cut to the desired shape and perforated on one edge similarly to motion picture film for exact registration by means of a small mounting block. With a quantity of these patches on hand, the theatre projectionist is able to repair quickly a broken sound record film or to join two such films without introducing any noise into the record.

Bell & Howell Resources are the resources of the cinema industry



B. & H. "Pioneer" Professional Studio Camera

At the founding of any great industry, there is always present some small group of pioneers whose clear vision not only lays the groundwork for that industry but which lights the way far ahead. Of such were those men who today continue to supply the cinema with the basic nourishment of its growth as an industry through the medium of Bell & Howell engineering.

More than a score of years has passed since Bell & Howell began the accumulation of knowledge and equipment upon which the technical progress of the industry was to depend. Today, the volume of its engineering data and the completeness of its technical equipment encompass virtually the entire resources of the cinema industry.

New Bell & Howell Engineering Development Building

Almost daily, new technical projects in the development of motion pictures are begun in the Bell & Howell engineering development laboratories. Almost daily, new and improved film production methods are established. You, also, are invited to submit your problem to this laboratory. The fullest of co-operation is assured.

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GOLD

A Short Story of the Old West

By A. KINNEY GRIFFITH

THE WILD heritage of Apache Indians and a long line of gun-fighting frontiersmen ancestors, made young Joseph Rharon the fightingest man on the Bar Z ranch. His amazing speed and accuracy with firearms was the reason he was selected to bring the monthly ranch payroll from Tonto City. And, for twelve months he brought the $2,000.00 through safely, in spite of the long trail infested with desert outlaws.

On one hot September day he received the payroll from the bank cashier. Putting the money into his saddlebags and leaving the bank, Rharon entered the Tonto saloon for a last thirst-quencher. A half hour before sundown he left the saloon a bit hilarious, and while the hostler cinched the saddle to his horse, Rharon strapped the saddlebags to the cantle.

"So long, see you next month!" he shouted as he started off at an easy dog-trot for the lonely ride to the ranch.

The sturdy bronco covered ten miles of the journey before dark. The rest of the trip was merely a case of smoking an endless number of cigarettes, remaining awake and keeping his eyes peeled for bandits.

At the ranch the cowboys were just leaving the cookshack after breakfast when Rharon rode up and dismounted.

"Hi-yah, 'Rip' Rharon!" the foreman shouted from the bunk-house. "Got the payroll?"

"You bet," Rharon replied, turning to the cantle to untie the saddlebags. But the saddlebags were not there. "Hell!" Rharon screamed and whirled around like a wild man with his six-shooter drawn and pointed at the cowboys who were gathering around. "Who took my saddlebags?" he snarled, his temper at the exploding point from fatigue, loss of sleep and fear over the money.

His flash of temper subsided as he realized that nobody had been near enough to his bronco to untie the saddlebags since he arrived. He holstered his gun and his black eyes darted around wildly seeking the solution of the mysterious disappearance of the payroll.

"Where's the money, Rip?" the foreman demanded as he approached. "Don't give me any bum excuses!"

"I don't know . . . . . " Rharon began, his black eyes flashing and his brain a-whirl.

"Where's our dinero?" a hard-bitten old timer demanded. "Don't try pullin' any kid stuff on us! Where is it?"

"Aw, I'll bet he's hid it in the mesquite, and is tryin' to gyp us," asserted one cowpuncher.

"Sure he did. Call the sheriff!" another yelled.

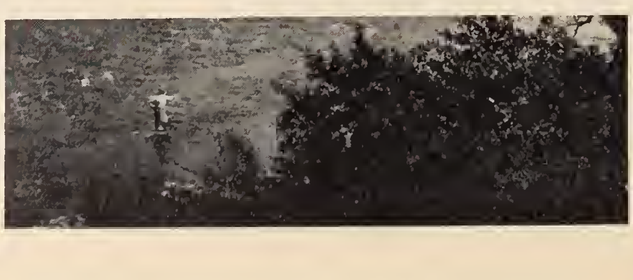
"Naw, lynch him!" the old timer snarled.

"I'll take your gun until this is settled, Rharon," said the foreman, stepping closer. "Put up your hands!"

"Like hell!" Rharon snapped, jumping backwards to his horse and drawing his gun with the dazzling quickness for which he was already famous.

"I must have lost those saddlebags on the trail," he announced after mounting and keeping the cowboys covered. "I'm riding back trail to look for them. Anybody that follows, gets shot—I'm rip rarin' to go!"

That last remark was characteristic of him and was the reason for his sobriquet "Rip." He whirled the bronco on its hind legs and raced off on the back trail. Several shots were fired after him, but bending low over the saddlehorn and riding like the wind, he was soon beyond range. The men ran to the corral, roped and saddled their horses and made all haste in pursuing, as they were firmly convinced young Rharon had stolen the payroll.



On horses fresh from an all night rest in the corral, the cowboys soon began to over-take the tired bronco. Rharon realized the men would rope and hang him to the nearest cottonwood tree without giving him a chance to clear himself. He also realized that chances of finding the saddlebags on the trail were mighty slim. Any wandering cowboy might have found them and kept on going as their contents represented a small fortune to the average range man.

Those thoughts made Rip desperate. The trail led into a narrow canyon, at the bottom of which he whirled the bronco and spurred it up the drybed. Before his pursuers arrived at the rim of the canyon and saw he had left the trail Rharon was out of sight around a bend. The men from the ranch rode through and galloped in the opposite direction. Rharon was two miles up the drybed before his pursuers discovered their quarry had eluded them.

RIP RHARON kept under cover by riding through canyons, going around sand hills instead of over them, avoiding main trails, and ever getting farther into the heart of the Painted Desert. A scorching sun shone down. Heat waves danced. Swirling sand storms stung his burning eyes, and his tough desert-bred horse finally began to falter.

During the afternoon the broncho picked up a rock in its shoe and began to limp. Rip dismounted and pryed the rock out with his knife, then walked ahead leading the horse. The pace was slow, and he wondered if he could make Sinking Springs before dying of thirst. His high-heeled boots were torturing him, yet he did not have the heart to re-mount and ride the tired bronco. He was determined to walk, at least until the cowboys should get dangerously close. Wondering where the posse was, he looked over the back trail, saw nothing, and plodded on. It seemed that he and the bronco were alone in the world.

SHORTLY before sundown, he arrived at Sinking Springs and on the verge of total exhaustion, both he and the bronco plunged their mouths into the cool water and drank. Leading the bronco into the shade of a nearby cottonwood tree, Rip felt somewhat refreshed, but utterly lonely and despondant. He was faint from hunger. Where to go and what to do now, was a serious problem. He knew he was an outlaw, yet he had committed no crime.

Suddenly he heard another horse approaching from the desert. He jumped up and lead his bronco behind a huge boulder. There he remained with rifle cocked and watched the springs. All Painted Desert travelers came to Sinking Springs.

In the twilight, Rharon drew a bead on the approaching figure just below the round white blob of its face. A man's heart should be there. Desperation burned through his body, hotter than any desert sun. He was cornered; his horse was tired and he could not go on tonight. His rifle followed the slow approach of the rider. He felt the metal against his trigger finger; the Indian blood coursing his veins urged him to fire, but his white blood urged caution. He gritted his teeth and hesitated. Then it was too late. He was trapped. The rider had suddenly halted, his eyes upon Rip's fresh tracks about the Springs. He wheeled his horse.

"Stop right there!" Rip snapped, rising to full height as he spoke. "Stick 'em up!"

With a swift movement the horseman obeyed and remained mounted while Rip walked around the rock and down the slope. Yet, as the two came face to face, the rider relaxed and fear left him.

"Rip Rharon," he snorted. "I thought you would keep on going." There was contempt in his voice.

"Get off," Rip snarled.

He recognized the rider now. James Harder, a young man whose father had sent to an

(Continued on Page 43)

To our Customers and Friends:

We desire to express our gratitude for all the kind messages that have come to us since the destruction of one of our Hollywood plants.

The many offers of cooperation from those in the industry whose experience enables them to appreciate the risk which we assume, have done much to assure us that they are sharing a responsibility with us which we genuinely appreciate.

We are thankful that the many safeguards, provided and employed, contributed so effectively to the protection of our customers' property.

Consolidated Service will be maintained.

CONSOLIDATED FILM INDUSTRIES, INC.

NEW YORK HOLLYWOOD

Pictures Ease Tired Nerves of Bankers

HOW motion pictures give them a new medium of self-expression and a new method for advertising their organizations and products, was discussed last month at the Banker's Industrial Exposition in New York.

The speakers on this day were Colonel Roy W. Winton, managing director of the Amateur Cinema League; M. L. Simmons, in charge of motion picture department of the Stanley Advertising Company; Edward F. Stevenson, President of Visugraphic Pictures, Inc., and Arthur H. DeBra, Assistant Secretary of the Motion Picture Producers and Distributors of America. Their addresses were broadcast over WRNY which is the official station of the Banker's Industrial Exposition.

According to Mr. DeBra's estimate, the number of people in the United States who are weekly entertained by the motion picture is about 100,000,000, or equal to the total population of the country. Mr. DeBra also commented on the great service to American export trade which the motion picture renders. "In every American picture shown in a foreign country there are always several articles, typically American, which appeal to the foreign audience," Mr. DeBra explained. "A manufacturer of an expensive motor car was puzzled recently by the unprecedented demand for his car which came from South America, although he had as yet made no particular effort to sell that field. The orders were traced to the influence of an exceedingly popular feature film being shown at that time in South America in which the leading character used an automobile of this exclusive type. And that is true of any number of products used by the actors in the films. An estimate has placed the value of American exports due to the influence of films at $1.00 for every foot of film shown abroad."

Banks are using the motion picture as a medium for advertising more than any other industry or profession, according to Michael L. Simmons, of the Stanley Advertising Company. Their Educational Film Division has made twice as many bank films as of any other type, although no particular emphasis was placed on soliciting this kind of business, according to Mr. Simmons. "I believe this proves that banks find in the screen a scope of expression admirably adapted to their needs," Mr. Simmons continued. "Banks build their advertising propaganda on messages of inspiration, self-preservation and economic security. They achieve their effects by the quality of the idea rather than by exhortation or high pressure selling . . . . In the development of these ideas the screen is particularly effective, and banks seem to have recognized this very definitely."

The hobby of making one's own motion pictures is becoming increasingly popular because it offers a new form of self-expression, according to Colonel Winton, director of the Amateur Cinema League. "The personal movie camera is a new palette and brush with which any one can create his own artistic interpretation of the things he sees," Colonel Winton said. "The amateur movie camera has placed an eighth art at the disposal of mankind. Proficiency in this art is far easier to attain than in the seven other arts and that has contributed to its popularity."

Sound and talking pictures are now practical for advertising purposes as small units are now available which are easily installed in offices, show rooms, business schools and other places where expensive equipment would be prohibitive, according to Mr. Stevenson, president of the Visugraphic Pictures, Inc. With the use of these pictures not only can a manufacturer illustrate his products but he can at the same time, deliver a sales talk with it.

Two French Sound Studios

ONLY two French studios are equipped with sound recording devices, according to latest word from Paris. These are the Mechen studio at Epinay, and the Gaumont studio in Paris. Plans are said to be under way to install sound equipment in several more.

Motion Pictures in the Air Now a Reality

MOTION picture shows in the skies on a regular cross-country passenger plane became a realty during the trip of a Trans-continental Air Transport plane which arrived at the Grand Central Terminal, Los Angeles, recently with a full load of passengers from Columbus, Ohio.

The pictures, on 16 millimeter film, were shown the passengers while the plane roared its way across the continent, and the program consisted of a Universal Newspaper newsreel; an Oswald the Rabbit comedy, and scenes from "Broadway," Universal's super-production now being shown in theatres all over the nation.

The showings were made through a special arrangement between the T. A. T. and Universal Pictures and proved a treat to the passengers. A 16 millimeter Duograph projector, weighing but 9 pounds and operated by dry cells, was used to show the pictures on a special daylight screen.

Universal was the first to show regular sound pictures upon a trans-Atlantic acean liner and, with the flight of the T. A. T. plane from Columbus to Los Angeles, became the first to show its product in the air on a regular scheduled passenger plane.

The picture show in the air was also a feature of the return flight of the big, three-motored plane to Columbus and judging from the success of the first venture will become a regular feature on all T. A. T. passenger planes.

Holland

The issue in Holland of four hundred and sixteen thousand shares in the Kuchemmeister International Acoustics Company has been over-subscribed about six hundred times. The Kuchenmeister system is absorbed in the Klangfilm-Tobis system.

Acoustical Control

(Continued from Page 4)

picture was in the foreground and the voice in the back. The speaker had just entered a door at the back of the set when the close-up was cut in, but the sound track used corresponded to the long shot. The result was that four out of five people who first saw it, got the illusion that the sound was coming from behind the speaker through the open door and they moved their heads to see who was in the room behind. This effect is not nearly so marked if the close-up is at the center of the screen. It is usually possible to use the same sound track for a close-up and a semi-long shot in the foreground, but almost never when the close-up is in the background.

Thus we come to a freedom of action which should be of interest to directors, artists, and writers. The artist is no longer limited to speaking within five or six feet of the microphone. The artist does not even need to know where the microphone is. It is unnecessary to talk to it or in the direction of it. You may talk with your back to it. You can put on a wildly raving scene, with the actors walking back and forth, talking at any time during the movement.

There is one other thing that has come out of this work. For some reason or other with sets which are more live—I don't know the technical explanation—it is possible to handle an apparently wider range of loudness so that if you go from a quiet dialogue suddenly into an excited dialogue, it is not necessary to yank the mixer dials around. There are two ways of controlling the loudness of the sound. With the mixer you take care of it with the technical apparatus.

There is, of course, a legitimate use of faking in a sound track when an unnatural sound is more artistic than a really natural one. Unless this is the case we have been trying to take the sound as naturally as possible. There is one other case where it seems legitimate to use dials and that is where you have two actors whose voices do not match at all in intensity. Actors of this type should not play opposite each other if they were on the stage. You can have then, one setting for the weak voice and another for the loud one. This tends to bring them into unison; but then again, you only have one setting for any given voice.

Bringing the Arc Back

City Engineers Perfect Apparatus Which Greatly Aids Studios

By PAT DOWLING

SOLVING one of the greatest problems which has confronted the makers of talking motion pictures, engineers from the Los Angeles Department of Water and Power, working with the staff of the Metropolitan Sound Studios and Experts from the Cinema Studios Supply Corp., have perfected apparatus making it possible to use "hard lights" on sound sets without the humming noises which previously prohibited the use of this erstwhile standard studio lighting equipment.

The men responsible for the new development, which is said by motion picture officials to be of far reaching consequence, are J. C. Alberts, supervisor of the Test Section of the City Bureau, and A. N. Owens of the Test Section, assisted by Wallace Oettel, chief of the Electrical Department at Metropolitan.

Some time ago, E. F. Scattergood, Chief Electrical Engineer of the City, became familiar with the problem of picture producers and detailed T. A. Panter, chief of operations, to make available the facilities of the Test and Research Section of the department. The problem was the elimination of the high-pitched whistle given off by the high-intensity carbon arc lamps which were being generally used in the motion picture studios. Since the advent of talking pictures, these lights could not be used on sound sets, and it had been considered necessary to throw into the discard many millions of dollars worth of this expensive equipment. A further difficulty was the fact that the producers have not been satisfied with the photography obtained from the exclusive use of incandescent lights, which have been used as a substitute on sound stages, and also that the latter type of lighting caused terrific heat, which made working conditions very difficult.

After many months of research, tests, and experimentation, a silencing device has been evolved which is so successful that it will be installed in all the studios in Hollywood as fast as it can be produced in quantity. The device is a low-impedence filter connected in shunt with the generator, affording a very low impedence pass for the higher harmonics, and consists principally of an electrolytic condenser of very high capacity. By its use arc lights are once more available for cinematography, increasing the light tone range, and giving the cinematographer a much wider latitude. At the Metropolitan Studio, where the experiments were conducted, these silent arcs are in general use. Among the companies now using this equipment on the Metropolitan stages are Sono-Art Productions, on whose "Blaze o' Glory" set were recently counted ten 24-inch sun arcs and over a dozen 100-Amp. spots of the old 'hard' type; Howard Hughes' "Hell's Angels;" and the companies making the Christie Talking Plays for Paramount. This actual use has proven that the problem has been definitely solved, and that the so-called "hard lighting" equipment may be used without the humming noises which formerly were picked up by the sensitive recording microphones.

Charles Christie, at whose studio the experiments were conducted, stated, "The local studios have all been experimenting for months in an effort to solve this difficult problem for their talking pictures. That the new method is of invaluable aid to the producers is indicated in the fact that it will mean salvaging an enormous amount of valuable lighting equipment and motor generators, and will mean the production of technically better talking pictures. The engineers of the City Department are to be heartily congratulated for their untiring efforts in this achievement. The simplicity of their apparatus makes it possible to apply it to any generator at comparatively low cost, and it accomplishes the desired results without impairing the efficiency or capacity of the generators. The city officials and engineers working under them are deserving the highest praise for this piece of service to the local industry."

Mr. E. F. Scattergood, Chief Electrical Engineer of the Municipal Bureau of Power and Light, stated, "We are gratified with the results. This cooperation of the engineers of this department with the Technicians of the Motion Picture Industry is in accord with the fundamental policies of the Department, one of which is encouragement of industrial expansion in Los Angeles by bringing new, and by assisting in more economical production by existing concerns.

"Any industry or group in our midst is therefore entitled to all our research facilities, and any problems of the Motion Picture Industry, one of the dominant industries of the nation, and surely one of the most progressive, would have received every effort of our research department even if the producers had not had an able staff of Technicians to work with us on this problem."

In a short time, it is announced, a public demonstration of this filter will be given, at which time the technical details and construction will be published.

Concerning Cinematography

(Continued from Page 5)

for myself, I prefer expertly photographed black-and-white to any of the color work so far available. It is more perfect, and less distracting. But there is no doubt a demand for colored films arising, a demand which will become universal when the technicians develop a really perfect color process; one that will show real people instead of pale, waxy dummies. Mr. Milner tells me that this will come when they work out what he calls a three-color process: I hope that one is developed soon, for it seems that they are forcing the growth of this demand for color, and if there aren't improvements technically, I think that the future of color will be unpleasantly dull.

And the future of talking pictures? Of course I'm an optimist! They are certainly here to stay, and, in spite of what everyone was saying a year ago, picture people are going to stay with them. Just think, now, of the greatest talkies of the last few months: *The Broadway Melody, In Old Arizona, Hollywood Revue, Coquette, Bulldog Drummond, Alibi, Thunderbolt, The Lady Lies*, and any others you might name—every one made by a silent-picture director; and where are the big ones made by your stage directors? Yes, the silent-picture-trained directors are going to be the ones who make this new medium the great thing it is going to be. And the new directors of the future are going to come from the picture-trained people, too, and as usual many of the best of these will be men from behind the cameras. For, whether you are making pictures silent or talking, you are still making pictures, and to make pictures you must first of all know how to see drama through the eye of a camera!

DeVinna Returning

OUT of the wilds of the African jungle via a little portable wireless set, has come the news that Clyde DeVinna, A. S. C., and the motion picture party sent there by M-G-M are now enroute home to Hollywood.

The party has been in Africa since last spring filming "Trader Horn." DeVinna, head cinematographer, took a portable wireless set with him, and for several months tried in vain to break through the ether and establish direct contact so his party could get all the home news. When it seemed as though he was doomed to fail he suddenly made contact with a station in New York. Since then he has contacted several other stations and has been sending and receiving messages daily.

The outcome of each world-series game flashed through the skies to the ears of DeVinna down in the jungle, and while lions were roaring in the surrounding wilds DeVinna was telling Director Van Dyke and the entire party about the collapse of the Chicago Cubs. And cheers of the ball fans drowned out the noises of the jungle night.

Then to DeVinna's lonely wife in Hollywood came the most joyful news—"Sailing for home November first"—So the party is on the way home and due to arrive here in early December.

When DeVinna arrives we expect to give the readers of the Cinematographer a wonderful story of adventure from his pen. As an example of what to expect, in our letter from him he told of how they cornered a vast horde of crocodiles in a dam. Then they had to stand guard at night to keep the "crocs" from breaking down the barriers. On one occasion DeVinna pumped a hail of 22-calibre bullets into an advancing "croc," but it kept on coming and when DeVinna's life was in danger another member of the party saved the day by firing a bullet from a high-powered rifle into the huge beast.

Have You Back Numbers?

If any subscriber has back numbers of the Cinematographer that he wishes to sell will he kindly communicate with the editor. The following numbers are wanted: Vol. 6—Nos. 4, 5, 6, 7, 8, 9, Vol. 8—Nos. 8, 9, 10, 11. Vol. 9—Nos. 4 and 7.

***Projection Engineering*, the new technical journal of the Sound and Light Projection Industries, occupies a prominent position in the "new industries" publication group. The editorial contents cover the engineering, industrial and technical developments in the rapidly growing fields of**

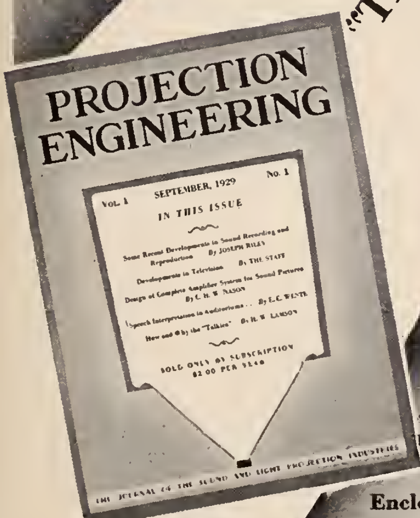
Theatrical Engineering

Home and Theatrical Sound and Light Projection

Television

***Projection Engineering* is published by the Bryan Davis Publishing Co., Inc., who also publish Radio Engineering and Aviation Engineering.**

"The Journal of the Sound and Light Projection Industries"



The editorial staff of *Projection Engineering* is headed by M. L. Muhleman, for years editor of Radio Engineering with Austin C. Lescarboura, Donald McNicol and John F. Rider as associates.

The first issue (September, 1929) will carry the following material—

Recent Developments in Sound Recording and Reproduction *by Joseph Riley*
Television Developments *by M. L. Muhleman*
Design of Complete Amplifier System for Sound Pictures . *by C. H. W. Nason*
Speech Interpretation in Auditoriums *by E. C. Wente*
How and Why the "Talkies" *by H. W. Lamson*
News of the Industry—New Developments (and other timely material)

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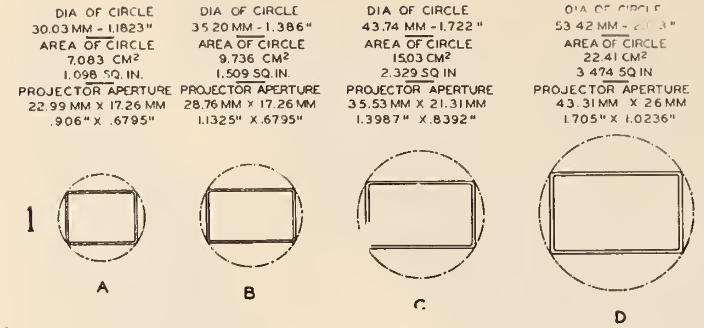
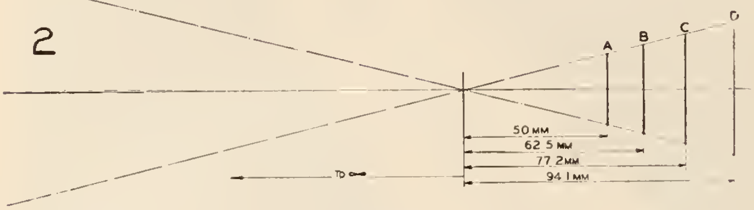
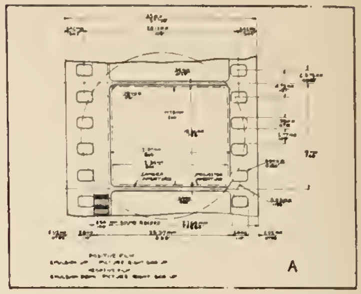
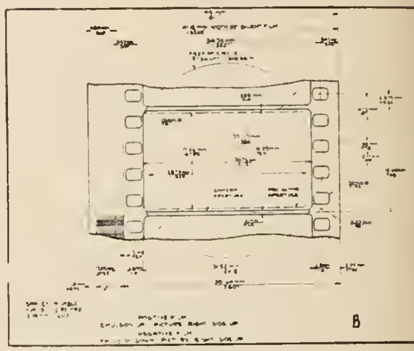








Some Practical Aspects and Recommendations on Wide Film Standards

An Abstract of paper, by J. A. Dubray and A. S. Howell, read at Fall meeting of the S. M. P. E.

THE paper is divided into three parts. The first dealth with the artistic and psychological effects of the rectangular shape in pictorial representation and their relation to Motion Picture projection, culminating with the assertion that the demand for a change in the proportions of the screen is not a mere desire to give the public a "bigger show," as has been stated at times, but is one of the most striking and significant steps in the progressive evolution of the Motion Picture Art.

In the second part of the paper the authors, after giving warning of the necessity of co-ordination of efforts within all branches of the Industry for the reaching of a decision in the establishment of a new Standard, present three dimensional proposals, which they call the "Economic," the "Spectacular" and the "Extreme."

The height of the "Economic" is equal to the sum of the pitch of four standard perforations, that of the "Spectacular" is equal to the pitch of five and that of the "Extreme" is equal to the sum of six standard perforations.

In the three proposed dimensions the sides of the rectangle are in the ratio of three to five.

The "Economic" is so called because its adoption would in-volve a minimum of time and capital expenditure for the alt a-tions and new developments necessary in the apparatus usec by the Motion Picture Industry.

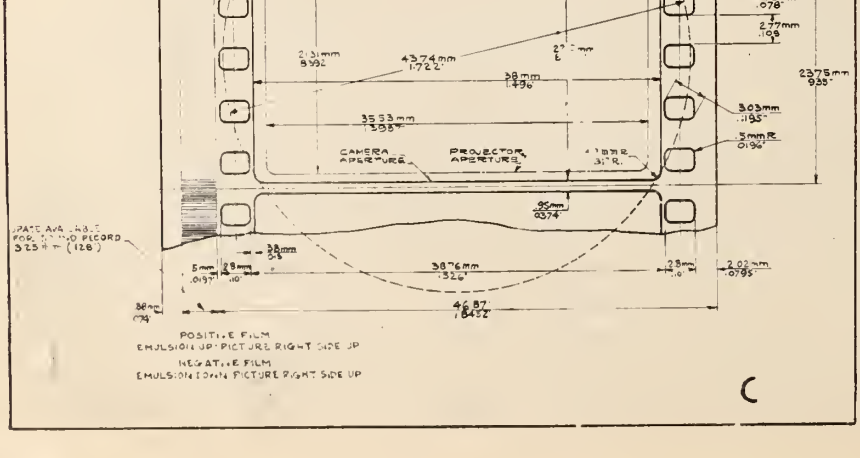
The "Spectacular" is so called because it presents greater po i-bilities than the "Economic" in refinement of execution and e-cause it lends itself to a more spectacular presentation of pict s. The cost involved in its development would be far greater t n that involved in the development of the "Economic."

The "Extreme" is so termed because its adoption would in-volve extreme expenditure of time and capital in its developm nt and because it would present extreme and perhaps excessive ab es in exploitation.

In the three dimensions, the position of the sound recor is outside the film perforations.

The dimensions and pitch of the perforations are recommen d to be maintained as per the standards in use with the 35 mm. fi s.

The rectangular perforation with rounded corners is rec i-mended for both negative and positive films.



Illustrations: Upper left, (1) area of aberrat le (2) Schematic drawing showing focal leng n standard 50 m m. lens. Upper center, pr se standard. Upper right, the "Economic" m proposal. Lower right, dimensions for the Ext

ROOS NOW AS

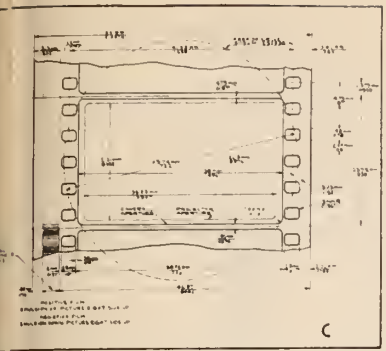
LEN ROOS, A. S. C., who recent points, has joined with Ralph F wood, and from now on will c apparatus.

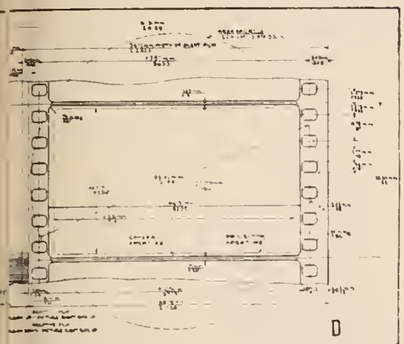
Fear has nearly perfected a new sou has been at work independently on a r ideas will be pooled and they promi field shortly.

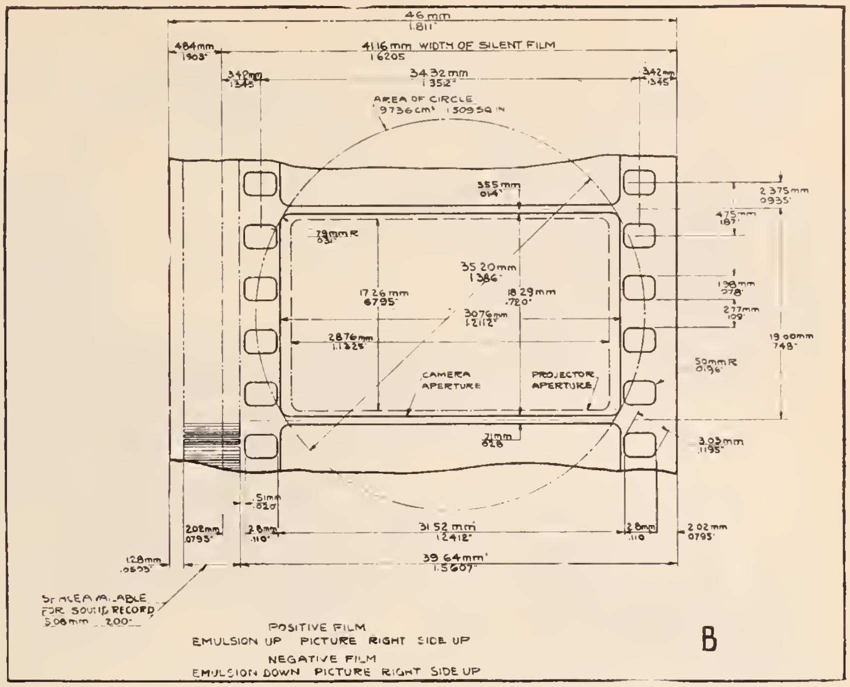
Fear is an engineer of exceptional on the market in the cinema equipme is mechanically very able.

"I feel that I could have made no l Roos, for his practical knowledge of of view will be of tremendous worth sensation."

"In joining with the Fear organizat business connection. Mr. Fear is an al to startle the industry with our sound







The problems pertaining to the photographic and projection ɔptical systems are briefly surveyed.

A comparison between the photographic lenses which would ɔe used for wide films and those used in today's talking pictures ɔractice, shows that the wide films would require a less extended ·ange of focal lengths for the same stage space.

It is the belief of the authors that the adoption of any of the ɨhree proposed dimensions would not involve radical changes in he present stage of development of Motion Picture photographic ɔbjectives.

In regard to projection, the paper mentions that although a ;reater screen image broadens the viewing angle in regard to correct listribution of illumination, it also increases the distance of the ɔptimum viewpoint from the screen and therefore reduces the ıumber of seats in the front part of an auditorium from which the ɛcreen can be viewed under acceptable conditions of good visibility n regard to light distribution and picturial perspective.

Mention is made of the necessity of redesigning the condenser ;ystem of the projection apparatus and that of changing both ɔrojection lamps in order to have the cathode spot to sufficiently ill the condenser.

The authors also point out the necessity of departing from the present practice of projection lens design, and foresee the development of projection lenses of the anastigmatic type.

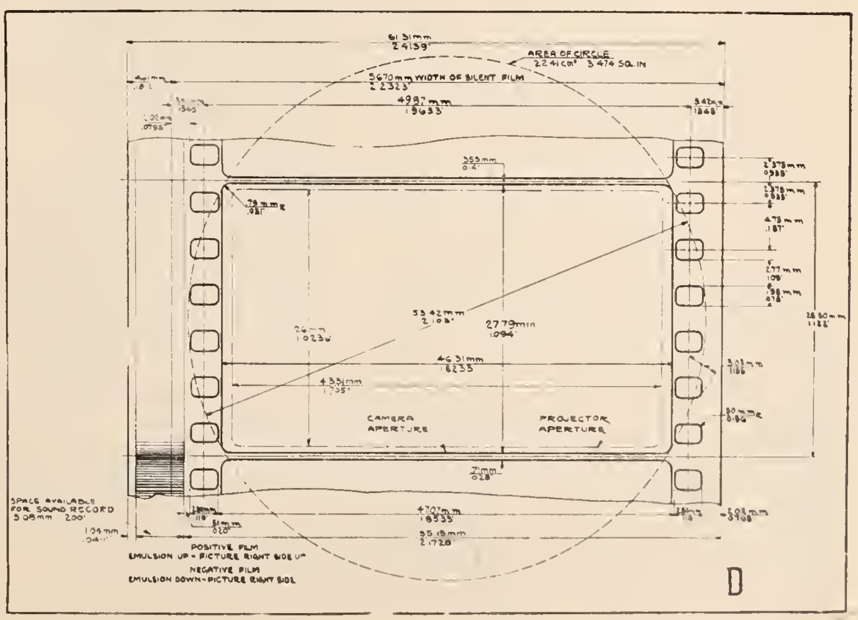
In the third part of the paper, the proposed dimensions are given in detail and the placing of the sound record outside of the perforations is recommended with a view to possible future developments in the sound recording system.

Serious consideration is given to the time, commercial and financial factors involved in a change of Standards and the necessity of devising a system of interchangeability of the projection apparatus in use today with those which will be necessitated by the new standards. Such system of interchangeability is deemed to be essential during the change-over period from one to the other standard.

It is finally proposed by the authors that the "Society of Motion Picture Engineers" form a special standing Committee, which should include representative members of all the branches of the Motion Picture Industry, as well as members of all recognized technical and business Societies within the Industry.

Such Committee should be given power and authority to discuss and take definite decisions in regard to the creation and adoption of a new Standard.

ss ɔwer of photographic lenses required for wide film. 'eared to cover the wide image width, compared with a ıd mensions of wide films compared with the 35 m. m. enɔns. Lower left, dimensions for the "Spectacular" tre" proposal.



CATED WITH FEAR

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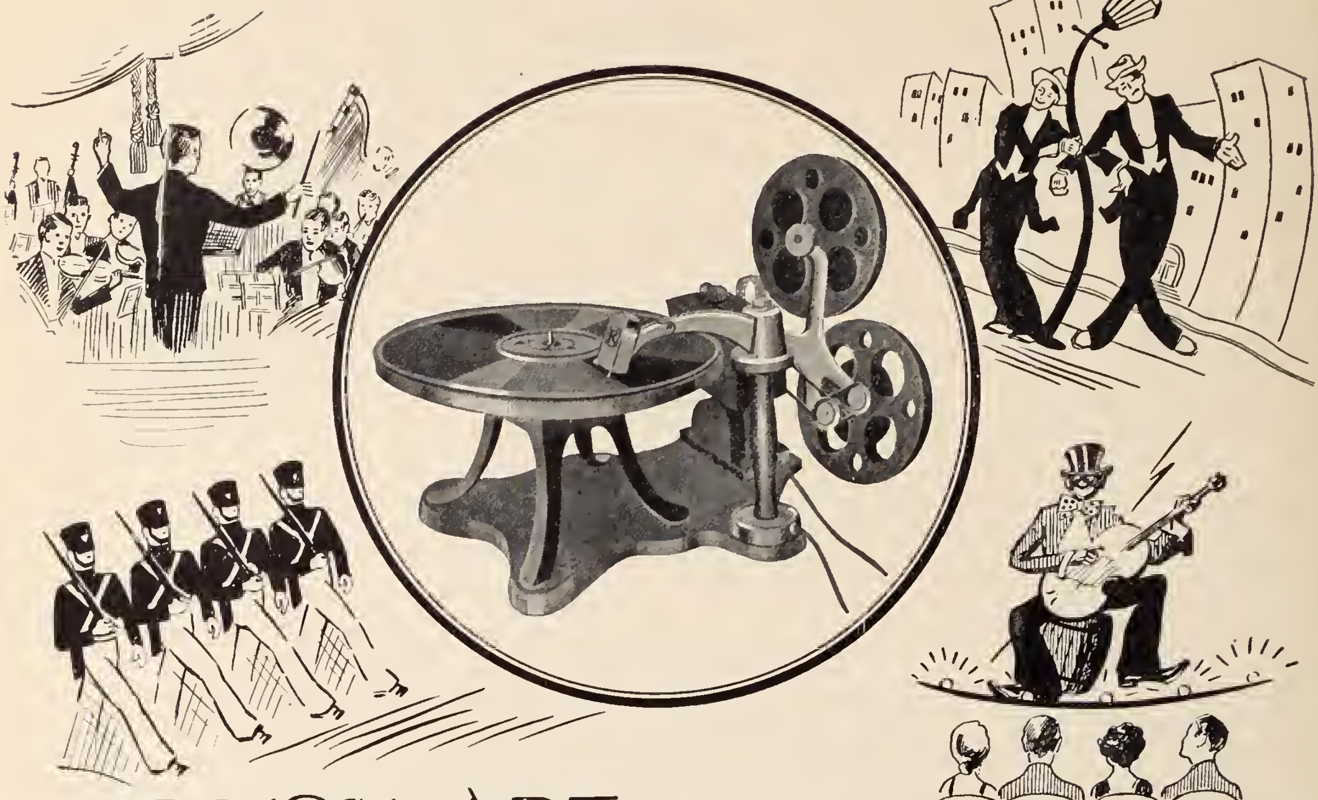
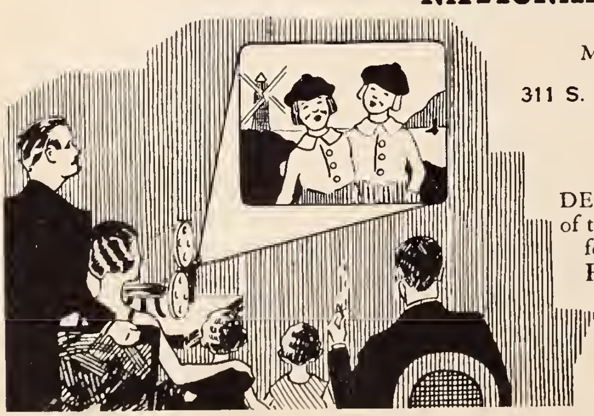
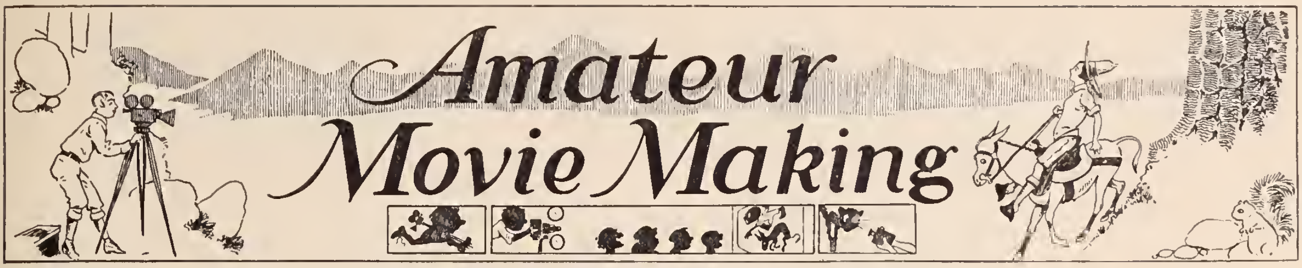
' said Roos, "I know I am making a happy erineer and I feel certain that we are going d:ts."







Amateur Movie Making

By WILLIAM STULL, A. S. C.

ALTHOUGH most of us have by this time gotten over the old-fashioned idea of photography as a purely seasonal activity, there still comes a very welcome pause along about November. While we can still find as many subjects as ever—perhaps more than ever—to invite our cameras, most vacations are over, and we've less spare time available during the daylight hours. This isn't by any means a misfortune, for it enables us to do something we might otherwise overlook: edit and title our films, and get them in really fine shape to show our friends.

After all, the greatest pleasure most of us get out of our hobby is showing our films to audiences. Their enjoyment, in turn, is governed by the quality of what they see on the screen. None of us enjoy watching an unedited, untitled, slipshodly presented picture, even if it is our own work; and there is no earthly reason for us to expect our friends to, either. Of course, in civilized countries, even our best friends won't tell us—verbally—but the efforts they'll make to dodge our future showings will speak eloquently. And, though amateur films don't have to worry about the box-office, a drop in attendance has the same dampening effect on amateur enthusiasm that it has on professional profits. Therefore, the amateur's first commandment should be: Thou shalt not show thy family or friends any of thy screen work which is not as perfect as thou canst make it.

Importance of Editing

The first step toward attaining this perfection is mastering the technique of effective editing. It ranks with the importance of mastering the camera technique, for editing, more than any other one thing, can make or mar a picture. Not merely splicing the scenes together in some sort of sequence, but really *editing* them: cutting out all imperfections; eliminating all that is extraneous and uninteresting; and, above all, arranging them so as to get the maximum effectiveness out of the minimum footage. After all, the primal purpose of all pictures—even the most banal snapshots—is to tell some kind of a story. To do this they must be able to arouse and maintain the beholder's interest. To hold that interest they must tell their story—whether it be "Ben Hur" or the Baby's bath—as compactly and effectively as possible. They cannot wander around from here to there and then somewhere else and still expect to be regarded as interesting. It is the editor's task to keep them from wandering—to keep them in the straight and narrow path of cinematic propriety. Whatever their story, they must be conceived, executed, and refined so as to tell that story with the least lost motion. Above all, they must never bore; that is the one unforgivable sin. A picture may have many faults, and still be passable, if it be not boresome; it may be otherwise magnificent, but fail if it bores. Professional films afford innumerable instances of this; every cinema goer can recall plenty of pictures in which weak stories were made interesting by the editorial treatment, and where potentially great ones were ruined by unimaginative cutting. Hollywood is full of tales of films made or unmade in the cutting-room.

Amateur films are no less susceptible to the influences of editing. Many an amateur library is discarded just because its owner did not know, or care, about the importance of proper editing, while some there are which, though intrinsically ordinary, have been made outstandingly interesting just by clever editing. Thus, as the amateur is usually his own general factotum, editing should take a place of importance on a par with camerawork, and it can be fully as great an opportunity for individual artistic expression as cinematography. Indeed, the individual character of many of the foreign productions that reach our shores is in a great measure traceable to their highly individual styles of editing: the British films, for instance, stressing the atmospheric background, almost to the injury of the plot; M. Dreyer's amazing use of intercut closeups and angle-shots in "Joan of Arc;" and the bewildering use of short cuts—flashes—in the Russian films, which, above all, are masterly examples of artistic cutting.

The actual apparatus required is simple. The most important accessories are a pair of rewinds—preferably double, so that the film may be wound in either direction—a splicing outfit—whose operation must be thoroughly mastered before serious editing is attempted—and a rack in which to place the individual small roles of film. A very convenient accessory, but one which is by no means essential, is a large hamper, lined with a cloth bag, and above which is a rack along which are disposed a number of film clips, or, better, small, wire hooks, from which a number of scenes may be hung, for quick reference—a whole sequence, perhaps, being grouped on one or two hooks. The trailing ends being in the bag (which should be kept perfectly clean) they are protected from dust and dirt. The film should never be allowed to unroll on the floor; it is too likely to collect dirt, and, perhaps, even be trod on and bady damaged. As an additional safeguard, professional film-editors always wear light, cotton gloves when handling film. It keeps the hands clean, and prevents fingerprinting the film; and, barring perhaps, the police records, there are few more unpleasant places for fingerprints than a motion picture film.

Taking a Leaf from the Professional's Book

Essentially, the *modus operandi* of cutting is not difficult. As in camerawork, the amateur can well take a few leaves from the professional's book. In the first places the scenes should be numbered: whether there be, as in a dramatic production, numbers photographed on the film, or no, the scenes should each be given an identifying number. These numbers should be catalogued, and a 'cutting continuity' prepared, giving a definite idea of the contents of each scene, and its place in the primary arrangement of the picture. Then the film should be broken down into its component scenes, each scene being made into a separate roll, and a numbered slip of paper attached. All similar scenes should be grouped together. When all this has been done, the picture should be roughly re-assembled, the scenes being merely clipped together with paper-clips. Then this assembled film should be inspected, and all imperfections, such as bad frames, partly fogged scenes, N. G.'d ones, etc., cut out, and the remainder spliced together. The picture can then be projected, and is ready for the real business of editing. This consists of eliminating artistic imperfections as the mechanical ones were removed: re-arranging the scenes to their best advantage, cutting in others that may be needed, and clipping off non-essential footage of all kinds, from a single frame to a sequence.

Editing for Emotional Effect

Editing has also an important bearing on the *tempo* of a picture. It can accelerate a lagging tempo, and tone down a too rapid one. If, for instance, certain scenes in a sequence requiring rapid movement seem to drag, they can often be speeded up by judicious trimming—cutting them so short that only the vital action of the scene is left; cutting exits as soon as the action of the scene is left; cutting exits as soon as the actor begins to leave the picture, and entrances when he is well into it. Most important in such sequences is the use of many closely intercut 'flashes,' for this is one of the simplest and most effective methods of building up a fast emotional

(Continued on Page 44)

Revolutionary Type Amateur Camera Soon to Appear

Producing Company Claims New Camera and Projector Will Reduce Cost 75%.

THROUGH an invention which enables motion pictures to be taken laterally as well as horizontally upon the same film, the cost of motion pictures for the home has been reduced seventy-five per cent, it is claimed, bringing home motion pictures within the reach of the great mass of people. A family in almost any circumstances, it is claimed, may take motion pictures of the daily events that revolve around the family group and preserve an active, animated record of life at a cost that is far less than the ordinary "still" pictures. The announcement of this forward step in home entertainment, to take its place along with radio and the automobile, was made by Clarence E. Ogden, President of the Kodel Electric & Manufacturing Company, pioneer radio manufacturer of Cincinnati. It is the result of the realization that radio, which became the fastest selling piece of merchandise in history early in its inception, even in the days of crystal sets, has pointed the way to home entertainment. Today, according to Ogden, home entertainment is changing the aspect of American home life, bringing entertainment, music, drama, religion, political viewpoint, etc., into the home. Realizing that the public welcomed any form of home entertainment and appreciating the fact that motion pictures, together with "talkie" devices would enable any home to keep a permanent, everlasting record of the history of the family, to pass down from generation to generation, provided the cost of operating a home motion picture camera could be reduced, Ogden, with outstanding motion picture engineers, started work more than three years ago to develop a new motion picture principle of operation.

A shot made with the new camera

This principle, perfected in Kodel laboratories last year, involved an expenditure of $200,000 to laboratory, machinery and special equipment, according to Mr. Ogden. At one time more than ten engineers were working on the problem. However, in July, 1928, the basic idea was conceived. A suggestion was made that inasmuch as the sixteen pictures per second, as taken by all types of motion picture cameras, and projected at the same rate of speed, were all taken in a single horizontal movement, or lengthwise of the camera, this automatically handicapped the reduction in cost of operation because the cost of the film is determined by length, having a fixed width of 16 millimeters. Therefore, it was decided, if pictures could be taken crosswise as well, it would enable the operator to take four pictures where formerly only one picture was taken, in the same amount of space, or four vision impressions where only one impression had been taken before.

The new camera is known as the *Homovie* and a projector which can project pictures taken by the *Homovie* Camera as well as pictures taken by any other type of 16 millimeter camera, is known by the same name. Registration of this trade-mark has already been allowed by the U. S. Patent Office, according to Ogden, as well as each of the 48 individual states. The necessary mechanism for accomplishing this increased efficiency of the camera and reducing the cost of operation seventy-five per cent is exceedingly simple. The two movements, moving the film across the front of the camera as well as horizontal, alternate with each other, so that the composite movement of the film and shutter mechanism produces a series of individual pictures arranged upon the film.

"The advantages of the *Homovie* Camera over all other motion picture cameras, in addition to decreasing the cost of operation, include the elimination of frequent reloading, at the end of short periods of time," says Mr. Ogden. "A roll of 16 millimeter film, such as is used in other motion picture cameras for home use, costs $6.00 and is 100 ft. in length, with a projection or motion picture visibility on the screen of only four minutes. The identical reel of film in a Kodel *Homovie* will give sixteen minutes of pictures. Consequently a roll of film only twenty-five feet in length, costing only $1.25 for the *Homovie*, will take as many pictures and give the same length of visibility on the screen as a $6.00 roll of pictures used in other machines and other cameras, including the cost of developing the film. It is the old, old story of improvement," he declares. "In the old days," continues Mr. Ogden,

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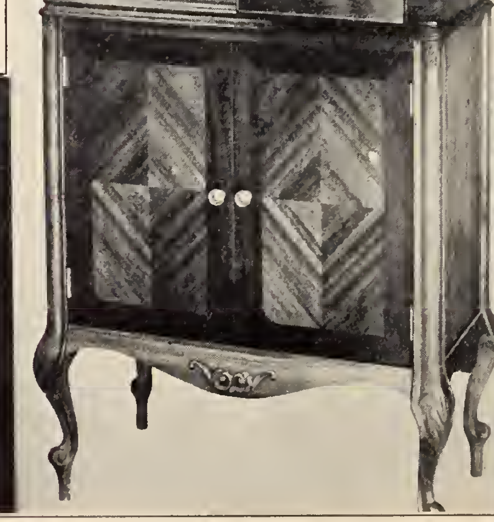


Left is principle of the new camera. Right shows difference between new method and old. Center is the new projector in operation

INFORMATION FOR AMATEURS

Amateurs—Send your problems to this department and we will solve them

Q. Can I use Magnesium flares, 20,000 cp., under a low roof; also, how do I ignite it? M. V.—Arthursburg, N. Y.

A. Magnesium flares cannot be used under low roofs; though in case of extreme necessity one might be placed at a very low level. As a rule, however, they should only be used where there is ample room, for they generate an intense heat. They are usually provided with a regular fuse by which they may be lighted.

Q. Will you explain the phrase, "—reversing the old idea of a light over the subject's shoulder to get third dimension effect," which occurs on Page 39 of the October AMERICAN CINEMATOGRAPHER? W. L. P.—Detroit, Mich.

A. This phrase presumably refers to Griffith's having instituted the now accepted practice of back-lighting his actors, and also to the practice of frequently lighting the background of a set very strongly, a practice which also contributed greatly to the separation of the planes.

Q. I have a great deal of film made with the now-extinct Movette camera, which took film about 17mm wide. Is there any way I can have this converted or reprinted for use with standard 16mm apparatus? J. D. J., Villanova, Pa.

A. Yes, we are informed that Albert Teitel, of 105 W. 40th St., New York makes a specialty of reprinting all such off-standard film to standard stock.

Q. Must one use a special filter with Eastman's 16mm Panchromatic film, or will one of the regular Wratten K series do?—E. L. P.—Rockford, Ill.

A. We believe the regular cine-kodak filter the Eastman Co. supplies is developed from the Wratten series, which are, themselves, perfectly satisfactory. For outdoor use, K2 is best; with arcs, K1½; while under incandescent lights no filter at all is required.

Q. Is it necessary to correct exposure for increased altitudes? —C. S. F., Jr.—Seattle, Wash.

A. Yes. A good rule to follow is to give normal exposures below the 4,000 foot level; from there to around 5,000 feet three-fourths normal; and from 5,000 to well over 6,000, half normal; and so on. Exposures must be further reduced if snow, or large bodies of water figure in the picture to any great extent, and still more yet if immediately after a rain or snowstorm, when the air is unusually free from dust. We recommend Panchromatic film and filters for all high-altitude cinematography, and, as the light conditions are more than usually deceptive, the use of some exposure meter like the 'Cinephot.'

Bell & Howell's Filmo 70-D

A few words about this Company's new camera from the paper read by J. A. Dubray at the recent S. M. P. E. meeting.

A NEW 16 mm. camera, known as the "FILMO model 70-D," has been presented to the amateur field by the Bell & Howell Company. This camera is of the spring motor type, having a capacity of 100 feet of film, and each winding of the motor permits to uninterruptedly expose 25 feet of film.

Equipped with an integral turret head, the camera is capable of holding three lenses of different focal lengths, and a newly designed viewfinder, permitting a rapid change of masks which determine the field of view covered by any one of six lenses of focal lengths varying from 1 inch to 6 inches.

The mechanism of the camera is described, and stress is laid upon the features of the speed regulating governor, which is of an entirely new design and instantaneous in its action. The governor permits to operate the camera at speeds varying from a minimum of eight to a maximum of 64 pictures per second, including all intermediate speeds.

A device has been incorporated in this camera which, together with the governor, insures a positive start of the mechanism at any desired speed and an equally positive stop at all speeds, without sacrificing the feature of the camera stopping with the shutter in its position of occultation, and without the slightest acceleration or deceleration being visible on the exposed film.

OF INTEREST TO AMATEURS

Goerz Mount for Filmo D

THE C. P. Goerz American Optical advises us that the temporary difficulty in fitting their Cine lenses to the new Filmo D Turret model has been overcome and that the users of the Filmo D can have their cameras supplied with any of the well-known Goerz Lenses.

The present mounts require slight alterations only to make them fit the Filmo D, except that it has become necessary to design an entirely new mount for the popular 15mm. wide angle Hypar. This mount is now in the course of manufacture and will be available in a short time.

Ingenious Editing Device

THE manufacturers of the well-known Ensign cine equipment have just announced an unusually handy device for editing 16mm. film. The device consists of a multiple rewind, enabling one to simultaneously inspect both the negative and positive films of a scene, side by side, and cut them together. The two films travel over an illuminated inspection-box, beside which is a conveniently-located splicer. The whole forms a most compact and convenient means of editing amateur films, especially where negative film is used instead of the reversal type.

A Remarkable Cinegraph

OWNERS of home projection machines now have the opportunity of seeing in their own living rooms the struggles and adventures of that brave band of scientists who in 1924 set out to conquer Mt. Everest.

Two lives were lost amid the ice and snow and the party suffered untold hardship. Now, according to announcement by Eastman, a 400-foot cinegraph of the ascent is ready for home movie lovers. A remarkable addition to the cine library.

A Tip

A piece of adhesive cloth, on which the title of the picture has been printed, will, if stuck on the metal reel of a processed film, enable you to identify the reel at a glance.

Going Abroad?

ARE you going to take your 16mm. camera abroad? If you are, the following advice will prove of benefit:

If you register your 16mm. motion picture film with the customs office at the point of embarking, they may avoid paying duty upon this film when it is brought back, exposed.

A tariff amendment is, at the time of writing, being considered which, if passed, will admit amateur moving picture film duty free. But until the existing regulations are amended, it is best to use the registration plan.

Using f.4.5 Long-Focus Lens

THE following excerpt from Cine-Kodak News is reprinted for the benefit of amateurs desiring to use the f.4.5 long-focus lens which is available for use with the Cine-Kodak Model B, f.1.9, the Cine-Kodak Model BB, f.1.9, or the Cine-Kodak Model A.f.1.9. This lens enables one to obtain close-up views of distant objects, and of outdoor sports, animals, birds and subjects that cannot be easily approached.

"It is anything but difficult to use a long-focus lens. There are, however, a few rules which should be followed to assure the best results. These rules are briefly reviewed here.

"Always use a tripod or some other solid support for the camera when using the long-focus lens. This eliminates camera movement which, in the case of the long-focus lens, is magnified tremendously on the screen.

"When in doubt about the exposure to use for long-focus shots, keep the exposure on the short side, but do not try to under- or over-expose.

"Judge or measure your distances as accurately as possible. Properly focused long-focus shots are clean-cut and beautiful on the screen; out-of-focus shots are blurred and unattractive.

"The best movies of distant scenes are made on clear days. On slightly hazy days, Panchronomatic Film and a color filter will give results when ordinary film would fail.

"Remember to keep the lens element of the long-focus lens clean at all times."

SIMPLE LENS FACTS

A Little Light on Lenses for the Amateur Movie Makers

By H. SYRIL DUSENBERY

THERE are certain basic facts and optical laws governing the camera lens that every movie maker should know. Lack of proper understanding of these simple lens facts makes intelligent picture taking unnecessarily difficult. There are but two adjustments to make on most amateur cameras before taking a picture. One determines the size of the lens opening or aperture, as it is called. This controls the amount of light that reaches the sensitive film, that is the exposure. The other adjustment is the distance setting or focus. This controls the distinctness of the image on the film. Both of these may be considered as lens adjustments. It is, therefore, essential that every movie maker should have a thorough understanding of this most vital part of the camera.

Every lens has a definite *focal lengrn.* Focus the lens on any distance object so as to obtain a distinct image of that object on a white screen back of the lens. The distance from the lens to this image is the *focal length.* The focal length of the standard lens ordinarily supplied with a 16 mm camera is one inch. This simply means that the film is exactly one inch behind the optical center of the lens when a distant object is in sharp focus. It is important to understand this because the *size* of the image depends directly on the focal length of the lens. This is illustrated in figure 1. Here "f" represents the focal length of the lenses. It is quite obvious from the diagram that the longer the focal length f the larger the image. Naturally, when the image is large, less of it can be recorded on the film. In other words, the field of view gets smaller as the objects themselves are larger. Telephoto lenses are long focus lenses. Their field of view is narrow and the image large. Wide angle lenses are short focus lenses.

It is a well known fact that the brightness or intensity of a particular light on a given surface depends upon how far away that surface is from the source of the light. To illuminate an object brightly, experience has taught us to approach the source of the light as closely as possible. We know that the brightness diminishes rapidly as we move away from the source of light. Therefore, if we have two lenses of similar size and construction so as to enable them both to pass exactly the same amount of light, the brighter image will be formed by the lens with the shorter focal length. Naturally, the further away the film is from the lens, (all other things being equal), the lens brilliant the image. To put matters the other way around, in order to have an image of definite brightness, the longer the focal length of the lens, the more light it must pass, hence the larger its diameter. This fundamental fact should be understood before we proceed further.

In photography, we are primarily concerned with the brightness of the image that falls on the sensitive film as this governs the exposure. We have just seen that this depends upon two things:

1. The focal length of the lens.
2. The diameter of the opening (aperture) of the lens.

In order to express what is popularly called the *speed* of a lens, that is the actual brightness of the image on the film, we must take both of these factors into consideration. This is done in a scheme of lens markings known as the "f" system. To determine the particular f number of a lens, we simply divide the focal length of that lens by its effective aperture, thus:

$$f = \frac{\text{Focal length}}{\text{Diameter of effective aperture}}$$

Assuming the shutter speed of the camera to be constant, we find that the exposure is directly dependent on the diameter of the effective aperture since, for any given lens, the focal length is a fixed constant. We control the aperture by a device known as the iris riaphragm. The f numbers engraved on the ring controlling the diaphragm thus express the intensity of the light that will be delivered to the focal plane. As this f number is a ratio, no matter how large a lens may appear or how long its focal length may be, any lens set at a particular f number will pass exactly the same amount of light to the focal plane as any other lens set exactly the same f number, assuming that the optical efficiencies of the lenses to be the same. This fact is often misunderstood. It means that no matter what the *maximum speed* (largest opening) of a lens may be, when it is set at some particular number, f.8 for example, it is no faster or slower than any other lens set at f.8. In figure 2 we have endeavored to show this fact. Here we have sketched two lenses, one has the maximum speed of f.3.5 and the other f.1.9. Both diaphragms, indicated by D, are set at the same f number. Hence, as the diagram shows, both pass the same amount of light. The only reason that the f.1.9 lens is called faster than the f.3.5 lens is because it is capable of being opened up more, thus allowing more light to pass thru, when the occasion arises. At similar f settings, they have similar speeds.

To complete our discussion of lens facts, we must mention one more thing. That is *depth of focus.* For a definite setting on the focusing scale, we find that, as far as the human eye can tell, objects somewhat nearer and also objects considerably further from the camera, than the principal object focused on, are in sharp focus. This distance, from the nearest object in focus to the furthest object, is called *depth of focus.* Without going into a mathematical discussion of just what constitutes sharp focus, we have attempted to illustrate graphically in figure 3 that the smaller the lens opening, the greater the depth of focus. In this diagram F represents the depth of focus. As we close down the lens opening, or diaphragm, the rays of light come closer together forming a narrower cone. With the lens wide open, F is reduced to a mere point. As the lens is stopped down, the distance between the near point in focus and the far points is seen to increase. In practice, this means that if we desire objects in the foreground, as well as those in the background to be in good focus, we must use the smallest lens opening possible that will admit sufficient light to enable the film to record the image.

The theory of lenses is a highly technical subject. This brief discussion has not attempted to go into the matter beyond stating a few simple facts that every movie maker should understand. It is hoped that these lens facts will enable the movie maker to handle his camera more intelligently and thus improve his screen results.

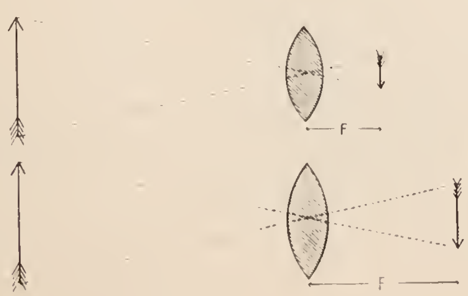


Fig 1

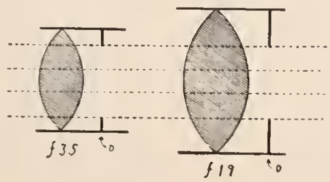


FIG. 2

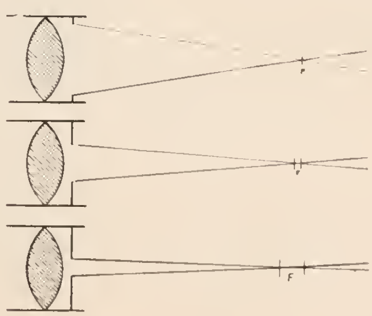


FIG. 3

Simple diagram on Lens facts

New Kodacolor Stations

THE number of Kodacolor finishing stations in foreign countries is rapidly increasing. Since the last list was published the following stations have been equipped to process Kodacolor:

Brussels: Kodak, Limited, Rue Neuve 88.
Rio de Janeiro: Kodak Brasileira, Ltd., Rua Sao Pedro 270.
Manila: Kodak Philippines, Ltd., Calle David 181.
Osaka, Japan: Cine-Kodak Service Japan, Inc., 1 Dojima Bldg.
Shanghai: Eastman Kodak Co., 24 Yuen Ming Yuen Road.
Lausanne: Kodak Societe Anonyme, Avenue Jean-Jacques Mercier 13.

Kodacolor is also being processed at Cine-Kodak Service, 422 East 10th Street, Kansas City, Mo.

Pan Film for Autumn

THE amateur movie maker who hopes to get the best gradations of tone, and therefore the best screen results, in his autumn movies will do well to use Panchromatic Film. This is because ordinary film cannot reproduce, in black and white, the colorful foliage or billowy clouds anywhere near as effectively as "Pan."

A color filter is recommended for use with "Pan" although excellent movies may be made without it. However, the filter should not be used for portraiture.

New Finishing Station

MOVIE makers living in the south-central part of the country will be glad to know that their Cine-Kodak and Kodacolor films may now be sent for processing to Cine-Kodak Service, 422 East 10th Street, Kansas City, Mo.

NEW SYNCHRONIZING APPARATUS FOR 16MM. WITH DISC RECORDS

ONE of the most interesting papers presented at the recent Fall meeting of the Society of Motion Picture Engineers, in Toronto, was given by Wm. Bristol, head of the Wm. H. Bristol Talking Picture Corporation. This paper dealt with a new synchronizing apparatus for 16 mm. films with disc records.

Mr. Bristol had his new device with him and gave a practical demonstration that was really amazing. His pictures were thrown more than thirty feet feet onto the screen and the voice reproduction was so natural one could close his eyes and imagine the speaker was standing on the platform talking, despite the poor acoustic properties of the room.

Some unusual things have been done by the Bristol Engineers in making this new Home Talkie device, and Mr. Bristol declares he will not stop until he has a perfect machine for the home at a price all can afford to pay.

His own explanation follows in part:

"In the operation of motion-picture projectors, where the film is synchronized with sound recorded on a disc or on a film, the standard speed of the projector is 90 feet per minute or 24 frames per second.

"It will be understood that the sound record, whether on a disc or on a film, must be reproduced at the same speed it was originally recorded, and in order to use the standard theatrical, synchronized film, whether of original width or whether reduced to 16 mm. width, it will be necessary to project the pictures at this standard speed of 24 frames per second.

"Professional projectors are always operated in booths for fire protection, which at the same time prevents the audience from being disturbed by the noice of the machine. All projectors, whether made for 35 mm. or for 16 mm. films, when operated in the open without a booth at the standard 24 frames per second, make so much noise that it is practically impossible to reproduce synchronized sound pictures satisfactorily. Projectors for amateur use are designed primarily to be operated at 16 frames per second. At this speed, it would usually be impossible to synchronize theatrical records, as they would only be running at two-thirds of the normal speed at which they were recorded.

To overcome the difficulties of operating these projectors, at the abnormally high speed that would be necessary to maintain synchronism and give correct reproduction of the sound, we have found, by experiment, that we can remove every third frame from the synchronized film, thus reducing it to two -thirds of its original number of frames and when projected at two-thirds the speed at which it was originally recorded, perfect synchronism will be maintained between the shortened film and the original sound record.

Although by this plan we have eliminated every third picture, we have found that, due to persistency of vision, it does not detract from the natural action of the picture.

By a specially designed printing machine, we are able to make prints from the original theatrical negatives, either of the standard width of the 16 mm. width, with every third frame eliminated. Such prints can then be used in either 35 mm. projectors of 16mm. projectors at the reduced speed of 16 frames per second, still producing results equally as good as though the picture had been originally taken at 16 frames per second. When projecting these shortened films, it is necessary to use a shutter designed for the projection of 16 pictures per second in order to reduce flicker to a minimum.

The complete outfit for reproducting these special synchronized 16 mm. or any other 16 mm. film, consists of a turntable unit connected electrically by a small cable of any convenient length to the 16 mm. projector, using the special synchronizers described in a paper presented at the meeting of the Society of Motion Picture Engineers, September, 1928.

We have developed a method of using the same type of synchronizing motors which were previously described, but now made up into smaller models, especially for non-theatrical, industrial and educational uses, so that the synchronizers can be used to replace the motors that are usually employed in 16mm. projectors. For illustration, in the 16 mm. Bell & Howell projector, we have been able to substitute for the motor which is usually supplied, one of these synchronizers. There is no other change in the projector, since the gearing at the turntable is made to give the correct speed ratios. The cord shown is a cable leading to a companion synchronizing motor, which is shown at the right-hand end on the base of the turntable which is now being projected.

The electric motor which is shown on the left-hand side of the base, through a worm and gear located in the center of the base, rotates the turntable through the vertical shaft at 33 1/3 revolutions per minute. The motor, in addition to driving the turnable, also turns the motor of the synchronizing motor on the base, which generates the current to drive the synchronizing motor which has been shown as a part of the projector.

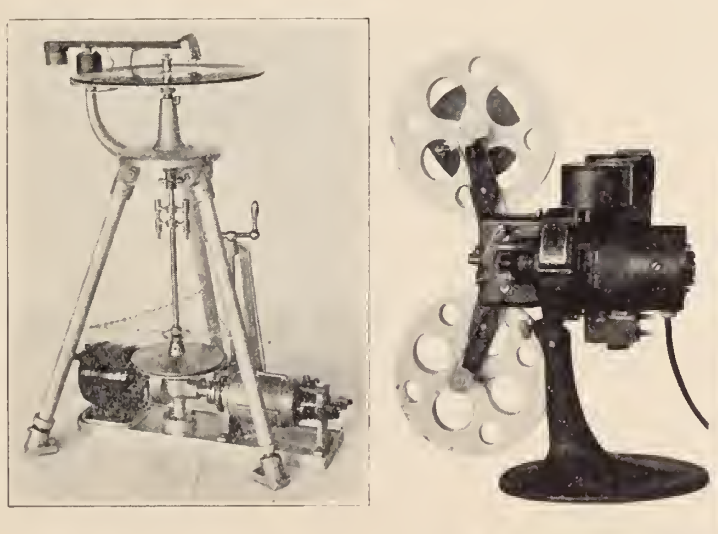
In order to make the synchronizing motor small enough to replace the original motor in the Bell & Howell projector, it is necessary that this motor should run at high speed, but such a high speed is undesirable at the turntable, as it may make noise and cause vibration, interfering with the perfect reproduction of the sound.

We have always made the synchronizers so that one drives the other at the same speed as has been previously described, but in this case the turntable synchronizer is made to drive the projector synchronizer at twice its own speed.

This is accomplished by making a four-pole synchronizer at the turntable and a two-pole synchronizer for the projector. The field of the turntable synchronizer is mounted on trunnion bearings, so that it may be rotated independently of the rotor of the turntable synchronizer. The rotation of this field on its trunnion bearings in a direction the same as the rotor is turning will cause a decrease in the speed of the projector, while the rotation of this field in the opposite direction to that of the rotor will increase the speed of the projector without in any way affecting the speed of the turntable or the quality of the reproduction.

A handle may be used for revolving the field of the synchronizing motor in its trunnion bearings through a pair of gears. By means of this, perfect synchronization may always be maintained with-

(Continued on Page 36)



Simplicity is an outstanding element in the new synchronizing apparatus of the Bristol Company. Above are projector and talking device which are synchronized

PROFESSIONAL AMATEURS

Hal Mohr, A. S. C., Gets Pleasure and Profit from His Cine-Kodak

By Wm. Stull, A. S. C.

Hal Mohr, professional amateur, instructs Director Paul Fejos in the art of making movies with a Cine-Kodak, on the Universal lot

WHEREVER motion pictures are shown, American cinematography is recognized as the world's finest. Even the most rabid critic of things American is forced to admit that the men behind Hollywood's cameras are, truly, "the cameramasters of the world", for in no other land is the standard of cinematic artistry so uniformly high. Yet notwithstanding this, there are few bodies of artists of equal rank who receive so comparatively little individual recognition. Probably this is due to the peculiar nature of cinematic art, which to be successful, must needs be unobtrusive; the best-photographed picture being the one whose scenes are in themselves beautiful, but which fit so perfectly into the story that they are only subconsciously noticed.

In such an art, particularly in a community where such high artistic standards prevail, the individuals who succeed in both satisfying the strict canons of their art and also stamping their work with a definite, individual style, must be rare indeed, yet in Hollywood there are disproportionately many who have succeeded in doing so. One of these men is Hal Mohr, A.S.C., who has in the past few years placed to his credit such brilliant examples of cinematic artistry as *Noah's Ark, Broadway, Shanghai Lady*, and is now adding to his laurels with *La Marseillaise*. No one who has seen any of these pictures can forget the superb and distinctive photography which featured them, for Hal Mohr is truly the Rembrandt of the silversheet. Like the great Dutch painter's, his work is a combination of idealism and realism, blended with masterly technique. Small wonder, then, at the place he has made for himself as one of Hollywood's leading Directors of Photography.

But Hal Mohr does not confine his cinematographic activities to his work of bringing Universal's super-productions to the screen; quite the contrary, for off the set he is one of the industry's most enthusiastic cine-amateurs. He owns one of the most complete cine-kodak outfits in Hollywood, and uses it just as he does his big Mitchell. It is perhaps, too, one of the hardest-worked outfits, for in almost everything he does, his camera takes part. Like all other amateurs, he films his friends, and the numberless intimate incidents that make personal films interesting. Besides, he films his travels, for he is an inveterate globe-trotter. The most recent excursion was to the romantic south seas, where he and his charming wife vacationed after the completion of *Broadway*. From this trip he brought home more than 4000 feet of film, both black-and-white and Kodacolor, of every phase of the trip.

The voyage took him across the Pacific to Pango-Pango, then to Suva, and from there into the virgin bush. After having seen, and filmed, all the routine sights the Fiji Islands offer casual tourists, Mohr and his wife chartered a native launch, and struck out for themselves, away from the beaten paths. Finally they found a native village so far removed from the haunts of tourists that the inhabitants had not laid eyes on a white man for over four years, and had never seen Americans. There they stayed for several weeks, living among these happy- childlike people, sharing their simple life, and filming a fascinating record of their joys and sorrows, of their work and play.

Among the many unusual incidents which Mr. Mohr's camera captured during this time was a fish-drive. The local chief, he says, had been away on a long journey—fully thirty miles—and the village was preparing a great feast against his return. As the whole life of the village was for the community, the entire population repaired to the beach, laughing, singing, and playing games, to await the right stage of the tide for their method of catching fish. When the time was right, they piled into their canoes, and paddled joyously to the outer reef which encircled the island. At this stage of the tide, the reef was under some three or four feet of water. Into this the men leaped, forming a great circle along a big, fibre cable, with the net at one end of the ring. When all were in their places, the circle, with much shouting, singing, and beating upon the water, slowly closed toward the net, driving the fishes before them as hunters in our western states drive jackrabbits. As the circle closed, the excited rhythm of the chants increased; the spell of the hunt became overpowering, until finally Mohr himself was overcome with it, and, laying aside his camera, leaped to join the shouting natives. But—true cameraman that he is—before he leaped he had recorded the whole chase in Kodacolor!

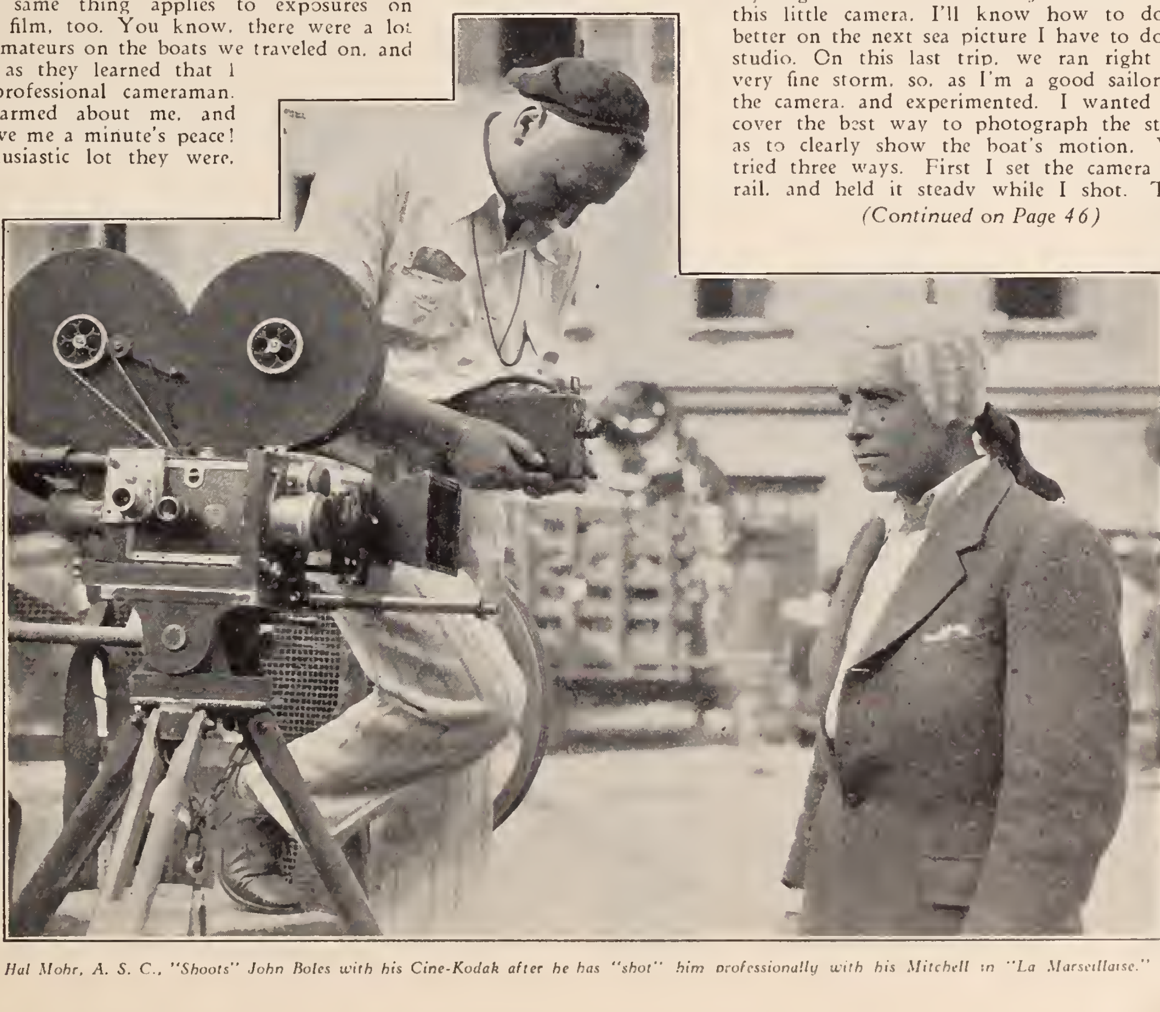
"I learned a good deal," he says, "about tropical cinematography on this trip; especially about color-work under these unusual conditions. You see, I wasn't able to get any of my film developed for more than two months after I exposed it. Even under the best conditions that doesn't help the film—but in the tropics it pretty nearly ruins it. However, I sealed up the cans as well as I could, and most of the films came through all right. That is, except the color stuff! The manufacturers say that that should be developed as soon as possible after exposure—and I'm here to tell you that they're right! A lot of mine was spoiled just because of that delay in developing, and, in spite of all the special care the factory experts took, it came out practically clear celluloid. The way we explained it was this: in this particular emulsion, the action of the light on the silver particles is progressive—the chemical change doesn't altogether stop when the light is removed, but slowly continues. During the time that had to elapse before my ,lms could be developed, this action went so far that ultimately there was no unaffected silver left to be transformed into a positive image by the reversal process, and thus there was left little more than clear celluloid. I found, on the other hand, that a number of scenes which I had thought were hopelessly underexposed, had by this same action so built themselves up that they were just about right. There's an idea for Kodacolor users; if you have had to underexpose scenes badly, wait a few weeks before sending them to the finishing station, and they may build themselves up to a contrast that if not perfect, will, at least, be an improvement. On the other hand, if you're in the position I was, months away from the nearest Kodacolor laboratory, deliberately underexpose, and let the film take care of itself. However, I can't recommend this to people who aren't fairly well experienced in Kodacolor work, so that they can be sure of themselves in regulating the exposure! For general use, though, I can't add anything to the makers' instructions, except: don't doubt 'em: These factory engineers have worked out the proper exposures and so on, and marked them down plainly enough so anyone can understand them—if he only will.

"The same thing applies to exposures on ordinary film, too. You know, there were a lot of cine amateurs on the boats we traveled on, and as soon as they learned that I was a professional cameraman, they swarmed about me, and never gave me a minute's peace! An enthusiastic lot they were, too! They asked me all sorts of questions—but the funny part of it was that they didn't really need my help on the point they asked most about; exposure. All amateur cameras have their exposure-guides marked plainly on them, usually right by the lens, and all I could add to them was a careful explanation of just what the various light-conditions mentioned meant. Beyond that, I had to tell them that they had all the necessary information right in their hands, if they'd only use it. The manufacturers have worked it all out so completely that, coupled with the extraordinary latitude of amateur film, one can hardly go wrong if he will only keep the instructions in mind.

"Personally, I've been amazed at the things I could do with my little outfit. I use it just the way I do my big Mitchell, but I find I can get away with things I'd never dare to do with studio equipment. And I've learned a lot with the thing. For instance, since using my cine-kodak I've learned more about making hand-camera shots, such as we use a deVry or Eyemo for in the studio, than I'd have thought possible. All sorts of little things, you know, like how to study yourself, pamming, and so on. For instance, in using the camera without a tripod, as we often must, I've found that the steadiest position is with the feet well apart, the camera at eye-level, and the breath held. That little matter of holding the breath is the big thing, for when you're not breathing, you are ever so much steadier. That goes double for pams; and, another thing, most of the amateurs I've met always pam 'way too fast. It must look awful on the screen. If they'd only think about that while they're shooting, it would save them a lot of film. If anything, they'd be better off to pam slower than what they thing is too slow. It might possibly make the scene drag a bit—but at least you could see what it was all about! By the same token, they might make their scenes a good deal longer without hurting anything. As long as a man has the price of a pair of scissors, he might as well shoot his scenes long enough to be understandable on the screen: then, if he finds them too long, he can cut them down. But how in the world can he expect to stretch out scenes which are too short?

"Yes, aside from the pleasure I've gotten out of my camera, I've gotten a good deal of profit, as well, for I can use it to do a lot of experimenting that I'd never be able to do with my big one. For instance, just because I own this little camera, I'll know how to do a lot better on the next sea picture I have to do at the studio. On this last trip, we ran right into a very fine storm, so, as I'm a good sailor, I got the camera, and experimented. I wanted to discover the best way to photograph the storm so as to clearly show the boat's motion. Well, I tried three ways. First I set the camera on the rail, and held it steady while I shot. Then, I

(Continued on Page 46)



Hal Mohr, A. S. C., "Shoots" John Boles with his Cine-Kodak after he has "shot" him professionally with his Mitchell in "La Marseillaise."

DREM All Over the World

September 30, 1929.

Drem Products Corp.,
152 W. 42 Street,
New York City.

Gentlemen:

We wish to advise you that we have found the Cinophot extremely valuable when used with our motion picture cameras.

As exposure is the only factor left to individual judgment, we find the use of the Cinophot renders motion picture photography fully automatic.

We are, therefore, strongly recommending the Cinophot to all our dealers and recommending it in our literature. We have instructed our sales force accordingly and hope to see each owner of one of our cameras supplied with one of these exposure meters.

Very truly yours,
Q. R. S.—DEVRY CORPORATION.
(*Signed*) GEORGE H. BLISS,
Vice-President

New Lighting Book for Amateurs

LEONARD WESTPHALEN, of Chicago, is furnishing home movie makers a valuable service in his new book on interior movie lighting, and the advice of the editor of this magazine is for every owner of a 16 mm. camera to write Mr. Westphalen for a copy of this book.

This little book explains the little secrets of lighting that are so baffling to the amateurs, and it will be mailed free to anyone asking for it. Mr. Westphalen, maker of the little Sunny Twin Lamps, knows lighting and no amateur can afford to be without his book.—H. H.

Recordion in Chicago

BURTON HOLMES LABORATORIES will be the mecca for Chicago home-talkie lovers from now on, for the distribution for the National Film Publicity Corporation's Recordion, home talkie machine, is now in their hands for the Chicago district.

This writer stopped off in Chicago and listened to this machine at the Burton Holmes Laboratory and was simply amazed at the marvelous quality of tone. It is a safe prediction that there will be many Recordions given for Christmas, if quality is desired.

Synchronizing Apparatus

(Continued from Page 33)

out in any way disturbing the projection of the picture on the screen.

It is of the utmost importance that the turntable be absolutely free of vibration in order to obtain perfect reproduction, especially of music. To accomplish this, we have developed a mechanical filter system which has proven very simple and efficient. It consists of mounting the turntable on a tripod, which stands on the floor independent of the base carrying the motors. A vertical shaft connecting the motor base with the turntable is provided with several flexible metal disc joints, designed particularly to filter out the vibration that would otherwise be transmitted to the turntable from the motor base.

In addition to these flexible discs, there is also a double sliding joint. This double sliding joint, working in conjunction with the flexible filter discs, has proven to be a most practical way of eliminating vibration, which would ordinarily be transmitted from the motor.

In conclusion I would like to call your attention to some of the advantages we think are to be gained by the use of these shortened synchronized films.

First, the noise of the projector is kept down to a satisfactory level without using a sound-proof cover, thus not interfering with the accompanying sound reproduction; second, the wear and tear is reduced on both the projectors and films, which means longer life for both; third, by using the film of reduced length, there will be an appreciable saving in the cost of the prints, handling, storage and transportation; fourth, this slow speed allows for increased length of the running time; fifth, the small space occupied by the equipment and the simplicity of its construction makes it easy to operate and desirable for homes, class-rooms, churches, clubs, lodges, etc.; sixth, the ease with which the outfit can be packed, transported and set up makes it portable and practical for demonstration and commercial purposes.

Give a subscription to the American Cinematographer for Christmas.

Your Makeup Problems

By MAX FACTOR

[*Internationally Known Authority on Makeup*]

Dear Mr. Factor:—I am sixteen and my parentts object to my using make-up. I know several girls of my age who use make-up and really you would hardly know it. I am sure if you will tell me how to do it, my parents will not object when they see how much it improves me—I am a medium brunette, brown hair—dark eyes, which sometimes look almost hazel, and my skin is not fair. Appreciatingly yours,

MAUDE S.,

Dayton, Ohio.

Answer:—It is my suggestion if you wish to win the approval of your parents, that you use make-up very sparingly. Before purchasing any make-up find out the condition of your skin—whether dry or oily, so that you may be able to get the preparations best suited, as make-up must be durable and natural, otherwise it defeats its own purpose. The proper shades for your type are: Natural powder, Medium Lip Rouge and Raspberry Dry Rouge.

Dear Mr. Factor:—I am giving a play for my church and there are three characters in it. I play the heavy—a man about thirty. A boy of eighteen with dark eyes and hair plays the hero, while the heroine, for contrast, is a blonde. My own make-up and the hero's I can manage quite well, thanks to your previous suggestions, but while I know the girl's general type, I am puzzled on how to make up her eyes—they bulge—really it is a pity, as otherwise she would be very pretty. Will you please advise me how to overcome this defect? Thanking you for your many past courtesies, I am,

Sincerely yours,

CHARLES MCA.,

St. Paul, Minn.

Answer:—Bulging eyes are successfully concealed by shadowing the upper lid with a dark purple lining color and high-lighting the center with a contrasting shade of the lining color. The high-light is applied over the shadow in the center of the lids. For the lower lid, draw a line as close as you can to the lash line with an eyebrow pencil and smudge it well into the complexion, blending the edges of the line, which gives a dark shadow, setting the eyes back.

Dear Mr. Factor:—There has always been a doubt in my mind on the correct way of applying eyeshadow. I am a brunette. What shade should I wear, and is it appropriate for daytime. Thanking you very kindly for your reply, I am,

L. B.,

Redondo Beach, Calif.

Answer:—Apply a thin film of Eyeshadow to the eyelids with your finger tips, using a light outward motion, blending it carefully upward and outward toward the eyebrows and the outer edges of the lids. No decided line should be visible. For a brunette, a soft shade of brown should be used. It is appropriate for day and evening wear.

Dear Mr. Fostor:—I have a receding chin, otherwise the contour of my face is not so bad. Will you please tell me how I can overcome this defect. I know how to use your wonderful Make-up, already having "found my type," so to speak.

Sincerely yours,

GRACE B.,

Mount Vernon, N. Y.

Answer:—To offset this effect it is necessary to use a powder

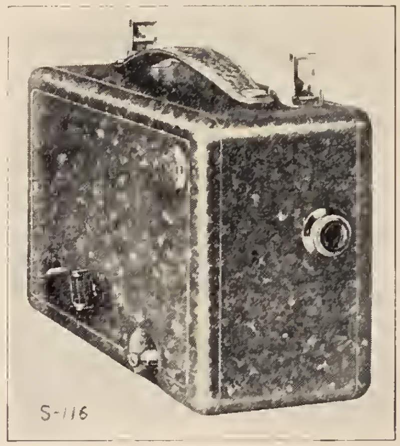
(*Continued on Page 39*)

New Type Camera

(Continued from Page 28)

"the automobile tire was considered good if it ran five thousand miles, although it cost more than the automobile tire of today that gives from thirty to fifty thousand miles of service."

This new development, according to Mr. Ogden, also heralds the showing of motion pictures in broad daylight. By the creation of what is known as a Day-Lite Recreator, the picture is



Here is the new camera

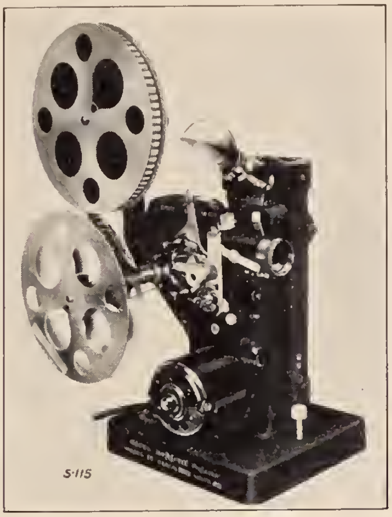
projected against a mirror at an angle of forty-five degrees, which in turn is shielded from light and reflects the picture through a translucent glass screen, reproducing the picture in all the fine detail in daylight, without necessitating the darkening of the room. "This," says Mr. Ogden, "is a revolutionary achievement which may have a far-reaching effect upon the showing of motion pictures in theatres. One may be able to enter a theatre where windows permit light to enter, and still enjoy the picture as much as though the theatre were darkened.

"Motion picture and camera enthusiasts who have witnessed private showings of the Kodel *Homovie*, as long as six months ago, expressed amazement at the saving this new device brings to the public," says Mr. Ogden. "The popularity of motion pictures in the home, admittedly one of the most popular forms of home entertainment, has been somewhat curtailed and made an exclusive pleasure for the man of means until the perfection of the Kodel *Homovie*. Where a man or woman desired to vacation, tour or take a general view of something of interest, it was necessary to buy from three to twelve rolls of film, costing $6.00 per roll. Today one roll of the *Homovie* takes as many pictures as four rolls of the former type of film. Manufacturers of film throughout the country have taken a keen interest in the development of this new camera and prophesy that the *Homovie* will do for motion pictures in the home what the Ford automobile did for people of moderate means. The films used in the Kodel *Homovie* are standard in every way, may be bought from any photographic dealer throughout the world, and are manufactured by several different companies.

"This new motion picture camera for the home" adds Mr. Ogden, "enjoys all the advantages of other types of motion pictures, color photography, reversible, negative or Panchromatic films, and can be loaded by a child in broad daylight. The camera is convenient to carry and is 8½ inches long, 3½ inches wide and 5 inches high. The operation is simple, with a view finder through which the operator looks at the scene he wishes to register, presses a button that releases a spring and automatically the horizontal and lateral motion begins, in perfect synchronization, taking sixteen pictures per second, operated by a spring motor constructed from Swedish clock spring steel."

The projector, made to project films taken by this new camera as well as the longer, more expensive type films taken by other types of cameras, contains a 250-watt projection bulb and concentrated filament, an accurately, specially ground 1⅛-inch silvered spherical mirror, carefully focused which reflects this intense light through a triple lens aspheric condenser, producing a powerful beam which, in turn, is reflected by means of a mirror through the film, objective lens and upon the screen. One of the remarkable features of this projector is that the operator may stop the projector at any time, leaving a huge still picture standing on the screen. A special heat absorbing glass shutter prevents film from breaking or blistering. The entire device, as well as the film, is fireproof.

"Motion pictures will form the backbone of our future records



Here is the new projector

of events of family and home life." Ogden stated. "Our news reels and other types of pictures preserve the events of general world-wide appeal, but in the home there has been no opportunity to photograph family "news" because of the almost prohibitive price involved until the development of the *Homovie*. When the suggestion for a motion picture camera for the home, within reach of every purse, was made we deliberately planned to improve upon other types of motion picture cameras and projectors for the home until we could arrive at a product that was economical to operate. It has not been the initial cost of motion picture cameras and projectors that has kept home motion picture entertainment away from the public, but the upkeep in the expense of films," Ogden stated. "Now that we have reduced this cost seventy-five per cent, bringing it almost in the same range as films for still cameras, motion pictures will soon be as popular in the home as radio."

Make-up Problems

(Continued from Page 37)

blended into the chin than you use on the other parts of your face. In that manner your chin will appear more prominent by being of a lighter shade than your general complexion.

Dear Mr. Factor:—I have read about the wonderful evening Make-up worn by the various screen stars and social celebrities at the Previews. Will you tell me how to accomplish the same effect. I am a natural blonde—my parents are from Norway—with blue eyes and very white skin.

THELMA G.,
Fresno, Calif.

Answer:—A perfect blonde with your complexion should wear a flesh powder, Bright lip stick, Blondeen dry rouge, blue eye-shadow, and touch up the eyebrowns with a brown pencil and brown masque for coloring the lashes.

Dear Mr. Factor:—As a result of scalding water falling on my face when I was a baby, I have a livid scar on the left side of my face about the size of a half dollar. Isn't there some way that I can cover this so it won't be so noticeable? My make-up does help, but the scar is still evident.

HELEN S.,
Topeka, Kansas.

Answar:—If you will write to my Studio personally, I will be pleased to send you a sample of a speal preparation that is applied before make-up which will conceal your scar completely. Please state your complexion and whether your skin is dry or oily.

German studios worked 213,766 hours in January and 161,153 hours in February, 1929, as compared with 168,839 hours during the same period last year.

Remote Control Used In Canada By Phonofilm

Installations being made in Montreal by the De Forest Phonofilm Canada, Ltd., are using the remote control volume system, whereby the sound in the houses is regulated from the auditorium. While the control system has no mechanical parts or motors used in its operation, it is claimed, it can be regulated to correct the tonal quality of each scene in a picture.

Fixing Baths

(Continued from Page 9)

6. *The Effect of Excessive Hardening*—Excessive hardening is apt to render the gelatin opalescent, especially if the temperature of the fixing bath is slightly above normal. The opalescence is usually removed during subsequent washing and drying and is ordinarily un-objectionable. If, however, the opalescence persists after washing, it may be removed by bathing the film in a dilute (1.0%) solution of sodium carbonate. This must be done at a relatively low temperature (not above 65°F.) because the carbonate solution destroys the hardening, permitting the gelatin to soften and swell, which may be followed by subsequent reticulation at higher temperatures.

It has also been considered that excessive hardening of the gelatin film increases the brittleness of motion picture positive film thus shortening its projection life. In order to check this, samples of positive and negative motion picture film were treated with an acid alum fixing bath so as to give melting points of 125°F. and 180°F., respectively. These films were stored for six months at 115°F. and at a relative humidity of 80%, and then stored for one year at 70°F. and 60% relative humidity. The films were tested for brittleness and the tendency of the emulsion to strip from the base at intervals during the keeping tests, and in no case was there any tendency of the emulsion to strip, while the films at no time were unduly brittle.

It is, therefore, considered that provided motion picture film is properly processed and thoroughly washed and stored under suitable conditions of temperature and humidity, moderate hardening with potassium alum does not materially impair the keeping properties of gelatin films.

7. *Factors Governing the Tendency of a Fixing Bath to Produce Blisters*—A large quantity of acid is desirable in a fixing bath because it permits the addition of a large quantity of developer before a sludge of aluminium sulfite commences to form. An excess of acid, however, may cause sulfurization, which in turn can be retarded by the addition of sulfite or a buffer salt such as sodium acetate[15], but the sulfite in turn lowers the developer capacity, whereas the acid was added to raise this capacity in the first place. The quantity of acid which can be added is likewise limited by the tendency of the bath to produce blisters on the films treated. The formation of blisters is largely due to the liberation of carbon dioxide or possibly sulfur dioxide formed by the action of the acid on the sulfite or carbonate contained in the film from the developer. The gases emitted in this manner form little gas bells in the gelatin which break when the pressure becomes sufficiently great, producing a crater-like appearance in the gelatin.

It was found that the tendency of a fixing bath to produce blisters is governed by the following factors:

a. The quantity of sulfite and carbonate contained in the film when immersed in the fixing bath, which in turn depends upon the sulfite and carbonate content of the developer, and the extent of the rinse, if any, between developing and fixing.

b. The rate of agitation of the film when first immersed in the fixing bath. Agitation removes the excess developer from the surface of the film and hastens its diffusion out of the gelatin, thus rapidly lowering the content of alkali. Agitation of the films several seconds after immersing in the fixing bath is one of the most effective means of preventing blisters.

c. The nature and thickness of the gelatine film. Films having a thick coating of gelatin under given conditions blister much more readily than thinly coated films.

d. The duration of the rinse or wash as commonly used between developing and fixing. The longer and more complete the wash with respect to the removal of the developer, the less is the tendency of the fixing bath to blister, because the substances which cause blistering have been either completely removed or their concentration so reduced that few or no gas bubbles are formed when immersed in the fixing bath.

e. The degree of swelling of the gelatin when first placed in the fixing bath which, in turn, depends upon the nature of the gelatin and temperature and composition of the developer, and the time of development.[16]

f. The acidity of the fixing bath. It was at first thought that the active acidity as represented by the hydrogen ion concentration measurements might be a measure of the tendency of a fixing bath to blister. The hydrogen ion concentration was determined for fixing baths containing widely varying quantities of sodium sulfite, acetic acid, and potassium alum, but in all cases the pH values were approximately constant, varying only from 4.5 to 4.7, although the tendency of the baths to produce blisters varied considerably. It is apparently not possible to correlate the hydrogen ion concentration figures with the propensity of a given bath to blister because a stable bath is sufficiently buffered to maintain a constant hydrogen ion concentration regardless of the concentration of acid used.

It was observed that the tendency of a bath to cause blisters increased as the total acidity was raised above the value at which blisters were found under average practical working conditions. The total acidity was determined by the quantity of a known alkali required to neutralize a given quantity of the fixing bath. Since the developer (MQ 25) represents a known alkali, and since it was used in all other cases in the testing of the properties of a fixing bath, it was also used to determine the total acidity of a fixing bath. The results are expressed in terms "the number of c.c. of MQ 25 developer required to neutralize 100 c.c. of fixing bath using phenolphthalein as indicator." It was considered that for practical purposes when a normal rinse is employed between developing and fixing and when the temperature does not exceed 70° to 75° F. the acidity of a fixing bath should not be greater than 150 c.c. For temperatures above 75° to 85°F. an acidity of 30 c.c. to 50 c.c. only is permissible.

8. *The Revival of the Hardening Properties of Fixing Baths*—Even the most suitable acid hardening fixing bath, compounded according to previous discussion, is rendered unsatisfactory for further use by the addition of developer long before the hypo is exhausted; that is, the various properties of the bath are so impaired that the fixing bath is rendered useless for further fixation because of (1) a decrease in the hardening properties; (2) the formation of a precipitate of aluminium sulfite; or (3) a sufficient decrease in acidity to permit discoloration of the bath, while the fixing power of the hypo still remains adequate for further use. It might be argued that the concentration of the hypo could be so cut down that the hypo and hardener should be exhaused at the same time, but to meet this condition the concentration of the hypo would need to be inefficiently low.

In order to determine the most suitable method of reviving the hardening properties it was necessary to determine first the products formed during exhaustion, and, secondly, the effect of these products on the properties of the fixing bath.

9. *Products of Exhaustion and Their Effect on the Hardening Properties of a Fixing Bath*—During exhaustion of a fixing bath the following products accumulate therein: developer and developer oxidation products, sodium silver thiosulfate, sodium bromide and sodium iodide, sodium acetate, sodium bisulfite, sodium sulfate, basic aluminium sulfites, and, occasionally, free sulfur.

The sodium acetate and sodium bisulfite are a result of interaction between the acetic acid and the sulfite and carbonate carried in by the developer, while some of the sodium bisulfite is converted to sodium sulfate by aerial oxidation. The sodium bromide and iodide are products of reaction from the fixation of bromo-iodide emulsions.

The addition of sodium acetate and sodium bisulfite to a fresh bath tends to increase the hardening produced and the sulfurization life of the bath. Sodium acetate does not affect the tendency of the bath to precipitate aluminium sulfite, while sodium bisulfite only slightly increases this tendency. Neutralization of the sodium carbonate by the acetic acid reduces the acidity of the bath, and by reference to the curves in Figs. 3, 4, and 5, it is seen that as the acidity is decreased the hardening increases up to the point at which aluminium sulfite precipitates.

It was also considered possible that the exhaustion of the bath by a given number of films might be accompanied by the absorption or removal of a given quantity of alum by virtue of the hardening imparted to the film, but this was shown to be negligible for all practical limits of exhaustion; that is, the quantity of alum removed by a given quantity of film was not sufficient to affect the hardening properties of the bath. This was determined by quantitative estimation of the alum content of a bath before and after exhaustion.

The other products of exhaustion: namely, silver mono- and di-sodium thiosulfate, developer oxidation products, and sodium and potassium bromide were found to have little or no effect on the hardening properties.

It is, therefore, apparent that the cause for the decrease in hardening and general usefulness of a hardening fixing bath when exhausted to the point at which aluminium sulfite precipitates is the unbalanced condition brought about by the neu-

(*Continued on Page 43*)

Gold

(Continued from Page 16)

tralization of the excess acid by the carbonate of the developer carried into the fixing bath, and also by the added effect of the increased quantity of sulfite present. For all practical purposes, therefore, it would appear that the revival of a fixing bath Eastern college only to have him return to the rangeland and become a professional gambler.

With scornful deliberation he swung from his horse and sat down by the spring. "Let me drink, will you?" he asked derisively.

"Why are you alone?" Rip demanded.

Harder did not answer until he had taken several gulps of water. He looked up at Rip and laughed. "Got seperated from the posse! Come on, kid, shoot! Better stand close and point that thing right between my eyes."

That remark made Rip Rharon boil with rage. He wanted to shoot and get it over with. Then he would be free. Yet he did not want to add murder to his record. True, he had shot several men, but that was when defending the payrolls. What quirk of fate was making him kill now? Either tie Harder to a tree where he might die of thirst and hunger—or shoot him dead. Just one shot. He must! He couldn't let Harder go!

Standing with the rifle clenched in his hands, Rip nerved himself with that thought. Just one shot! Rip felt he would explode. It seemed an eternity that he stood thus, then James Harder sneered up at him.

"You're a coward, Rharon! You can't kill me, and you're an awful dumbell. Believe me, kid, if I started out to steal a couple of bags of gold, I'd make a good job of it!" His boastful remark turned into a jeer. "Come on, when does the shooting begin?"

Suddenly Rip's eyes widened, then narrowed to mere slits. The Indian in him was again coming to the fore. He saw it all now: the money in former payroll shipments had always been in bills, with the serial numbers copied to give a working clue in case of robbery. But this one time the Tonto City Bank had been short on paper, so the cashier made up the payroll in gold pieces. No one save the cashier and himself had known that—yet Harder knew it was gold!

"You damned robber!" Rip screamed; dropped his rifle, and with one leap was all over Harder.

"You crook!" Rip snarled again, and fought with diabolical fury. "Give me my two thousand dollars!"

The college trained athletic prowess of James Harder did not avail against the furious onslaught of the young cowboy. It was like pitting a well-trained bulldog with a wild cat. One minute after the fight started, Harder was stretched out cold.

Rharon, the savageness in his body having been spent, left his enemy and went to Harder's horse. After fumbling with the saddlebags, he drew forth the two sacks of gold pieces. There was no need to count them. They were all there. The bank's seal was still unbroken.

Back by the prone form near the water hole, Rharon paused, then suddenly stopped and splashed water on Harder's face. After a moment his eyes opened slightly; he started to speak, but sputtered over his battered teeth. Then:

"A-ll r-r-ight, you w-ild Geronimo, you win!" acknowledged Harder. "I found your saddlebags lying in the trail, examined them, and found that it was gold. Then I met the posse that was after you, but I figured it would be a good chance to pay off some old gambling debts that I had, without father knowing about them. So, I kept on going with the money. Now, damn you, what are you going to do about it?"

For a moment Rip Rharon stood silent, looking down at Harder, who now had risen to a sitting posture.

"You can go to hell, so far as I care," replied Rharon, after some thought. "I'm taking the money back to the ranch where it belongs!"

New Portable Projector

A NEW type of portable talking picture equipment designed to "bring audible and visual education to a point of easy and practical usage" was demonstrated recently by RCA Photophone.

The portable equipment can be set up in about 15 minutes, it is stated, the suitcase-size projector, small screen and folding horn of a size to fit with ease into an automobile. The trunk is about as large as a wardrobe trunk when folded. The projector weighs under 100 pounds, it is stated. Volume and clarity of tone are claimed as features of the equipment.

Fixing Baths

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should be accomplished by the addition of a given quantity of acid at certain intervals.

*If the bath does not precipitate a sludge of aluminium sulfite in 2 days at 115°F., it will not sludge at room temperature within a period of one to two weeks and is, therefore, satisfactory.

(To be Continued)

Amateur Movie Making

(Continued from Page 27)

tempo, as M. Eisenstein demonstrated in "Potemkin." If, on the other hand, the tempo desired is a slow, peaceful one, the scenes should be run to their maximum footage, with as little intercutting as possible. There is also one very important canon to be observed in all cutting and intercutting: a photographically dark scene should never be placed next to a light one, except in the rare cases when the contrast is deliberately planned to heighten some dramatic effect, as, for example, a cut from a scene showing the hero's squalid surroundings in the slums, to the heroine's boudoir on Park Avenue. In this case the contrast between the low-key photography of the first scene and the high-key photography of the second heightens the emotional contrast of the two settings. Incidentally, if it were desired to establish the fact that the poor hero was in a happier *milieu* than the wealthy heroine, the photographic contrasts could be reversed, and be equally powerful aids to the action in building up the emotional response desired.

Another vital point is the closeup. Although this device has too often been run to death in professional films—due largely to the supposed necessity of keeping stars' faces before the public—it has not as a rule been employed sufficiently by amateurs. Properly used, the closeup is the most economical and powerful story-telling expedient in pictures. It is an excellent practice to take closeups to match every long-shot, wherever possible. Then, after the long-shots of the film have been completely assembled, the picture can be studied on the screen, and the exact places to insert the closeups determined. Never try to insert closeups before this study: it cannot be done satisfactorily.

New Films for Old

All of this applies quite as well to old films as to new ones, for re-editing is often able to give a surprising newness to films which are so familiar as to seem tiresome. This is also true of the commercial library films one may own, though, as most of these have been edited by experts, one should guard against over-refining them in the re-editing.

Another aid in either editing or re-editing is the possession of a good assortment of 'stock shots.' All the studios maintain such stock libraries, and in addition often find it necessary to purchase additional material from the several commercial stock libraries in existence. Therefore, in cutting the amateur picture, no scenes of even passable photographic quality should be thrown away; instead they should be carefully saved, and catalogued for future reference. Furthermore, the amateur should at all times be on the lookout for scenes of interest to add to that library. Very often he will come upon some unexpected bit of action while filming something else: don't be afraid to use a few feet of film on such bits, for there is no telling how useful they may be in the future. The same applies to even the most ordinary scenes encountered while travelling, which can, with the aid of a little ingenious editing, give the impression that the whole action of a picture was photographed around the location of the 'stock shot,' instead of at home, as it actually was. The studios make use of this expedient in many of their films which, though actually photographed in Hollywood, may seem by the aid of ingeniously-intercut stock scenes, to have been made abroad. Of recent films, of course "The Four Feathers" is the most outstanding example of this, for while none of the principals so much as ventured outside the gates of the Hollywood studio, the scenes which were actually photographed in the Soudan were so cleverly cut into the picture that the audience was cajoled into believing the whole thing occurred there. Careful study of this and other similar pictures will soon show the immense value of such individual libraries of stock scenes for amateur use, as well as for professional.

Color

Still another point to be considered is the application of color. Nothing else can add more charm and newness than the judicious use of the various methods of coloring monochrome pictures, which invariably seem to breathe new life into even the most ordinary films. While as yet the amateur does not have the same variety of tinted film-stocks available that the professional has, he can obtain an assortment of sufficient range to open up new vistas before him. In the positive film there are some half-a-dozen colors to choose from, as the different manufacturers coat their positive emulsions on a variety of tinted bases. Furthermore, a number of the larger laboratories about the country are equipped to *tone* amateur films as well. *Toning*, it may be wise to recall, is the process of coloring the emulsion, but leaving the highlights clear, while *tinting* is just the reverse, coloring the film-base itself, giving an image in black against a colored ground, and is usually done by coating the emulsion directly onto colored celluloid. The tints commercially available are straw, amber, blue, green, flame, and violet; needless to say, they are only available on positive stock. However, the various color-disc arrangements available for projectors enable nearly the same results to be had with reversal film. The only tones most laboratories furnish in the small quantities needed by amateurs are blue and sepia. Used either singly or combined, these various colors give monochrome films a warmth and life impossible of description. One can hardly more than suggest a few of the possible uses of these tones and tints, but among them may be mentioned sepia, for hunting scenes; blue *tones* for snow-scenes, clouds, and some marines; blue *tints* for marines where water and sky predominate, and are rendered light; the same blue tint for night-scenes; amber, for artificially-lighted interiors, and scenes in which the warm, golden glow of sunlight figures strongly; green, for landscapes; flame-color for fire scenes, and those lit by flares and campfires—especially the latter, which it renders particularly realistic. Combinations of tones and tints go even farther to make a film seem lifelike. For instance, scenes taken in the woods—like the many hunting scenes that will be filmed this fall—are made surpassingly lifelike by the use of a sepia tone on a green-tinted film-stock, while marine sunsets gain a new beauty when shone in a blue-toned image on either flame or pink tinted stock. One could extend such a list as this almost indefinitely, for the possible tone-and-tint combinations are innumerable, and their uses bounded only by the creative ingenuity of the individual. However, as space does not permit it here, let me refer those who are interested, and who enjoy doing their own laboratory work, to the excellent little booklet on the subject published by the Eastman Company, and to the similar articles which are being prepared for the forthcoming "Cinematographic Annual."

Keeping Films Clean

Aside from editing and coloring, there is another operation which should frequently be performed on all films: this is cleaning. Even under the best conditions, dust, grease, and dirt eventually gather on movie films, and, unless removed, can and will speedily ruin them. There are a number of excellent film-cleaning solutions on the market, almost any one of which, properly used, will add years to the film's life. Carbon tetrachloride is also said to be an excellent cleaning solvent. If films are properly cleaned once or twice a year, not only will their effective lives be appreciably extended, but their brilliance on the screen, as well. This is of special importance with Kodacolor films, which become dimmed and unsatisfactory if only slightly dirty. Since the process of cleaning is simple, and so enormously worth-while, no amateur should overlook it. After all, our pictures are judged by their appearance on the screen, and since that is so dependent upon their good condition, no one should begrudge the time spent in cleaning them, nor the thought, time, and money expended in properly editing, toning, and tinting them.

New Model Sound Truck Eliminates Batteries

THE latest improvement in portable sound-recording equipment is the substitution of a motor-driven generator for the batteries as a source of power for the recording apparatus. Upon the recommendation of Elmer R. Raguse, chief recording engineer for the Radio Victor Corp., the Electrical Research Products, Inc., have fitted one of their standard 3½-ton portable sound trucks with a gasoline-driven D.C. generator and a 220-volt, 3-phase A.C. generator and distributor in place of the usual batteries. The change not only increases the effective working time of the outfit, but also eliminates a great deal of bulk and weight, and insures cheaper operation.

The first of these new-model trucks to reach the Pacific Coast has for some time been in use by the Hal Roach Studio, whose recording is done by the Victor experts under Mr. Raguse. So successfully has the apparatus performed under service conditions that the manufacturers have decided to do away with batteries in all portable recording equipment used by licensees of the Western Electric process.

Here is another of Charlie Clarke's pictures for your stereoscope. This is Sue Carol, Fox star, snapped on location

J. I. Crabtree, new President of the S. M. P. E.

Crabtree Elected

Crabtree Elected Head of Motion Picture Engineers

J. I. Crabtree, of the Research Laboratories of the Eastman Kodak Company, was elected president of the S. M. P. E. at the Fall Convention, held in Toronto last month.

Mr. Crabtree was born in England on March 27, 1891, and received the degrees of both Bachelor and Master of Science from Victoria University at Manchester. He entered the Eastman Research Laboratories in 1913, where he is now in charge of the departments of Photographic Chemistry and Motion Picture Film Developing.

Mr. Crabtree has contributed many valuable papers to scientific photographic literature, and is a recognized authority throughout the world. Many of his papers have been reprinted as handbooks and are in use generally.

Mr. Crabtree has held the following positions in the Society of Motion Picture Engineers:

Chairman Papers Committee, 1925-28; Chairman Publications Committee, 1926-29; Chairman Progress Committee, 1928-29; Member Board of Governors, 1927-29.

Camera Aperatures

(Continued from Page 7)

ture for projection of sound-on-film talking motion pictures:

BE IT RESOLVED: that as a temporary measure this committee recommends that all studios and cinematographers using sound-on-film methods make marks on the camera ground glass equally spaced from the top and bottom in addition to the mat or mark for the sound track; these marks to delineate a rectangle 0.620 by 0.835 inches in size and that all vital portions of the picture be composed within these limits.

BE IT ALSO RESOLVED: That the committee further recommends that theatres which make a practice of re-establishing the full screen proportions from sound-on-film pictures do so by the use of an aparture whose size would be 0.600 by 0.800 inches on the basis of projection on the level, the horizontal centre of the aperture coinciding with the horizontal centre of the S. M. P. E. Standard Aperture.

Copies of this resolution have been sent to executives of all motion picture studios and leading theatre chains. The following studios have already reported that markings would be made on the ground glass of all cameras in accordance with the specifications contained in the resolution: Paramount-Famous-Lasky, Metro-Goldwyn-Mayer, United Artists, Pathe, Universal, R-K-O, Tiffany-Stahl, Mack Sennett, Darmour, and Educational. Present markings on Fox studio cameras approximate the recommended practice. This assures a uniform practice in the studios that anticipates and is in accord with existing practices in the theatres. The aperture dimension recommended to theatres represents a mean of dimensions reported by theatres now using the smaller aperture and may serve as a guide to theatres which may choose to adopt it in the future.

Professional Amateurs

(Continued from Page 35)

held it in my hands, and swayed against the movement of the boat. Finally, I held it, sighted it on the horizon, and rocked back and forth, keeping the horizon level. After I got home, I compared the three takes. The first one was far and away the best. The action in the foreground was clear, while the way the sea jumped around in the background gave just the right effect. It darn near made me seasick to watch it; it got the impression over perfectly. Well, after this, I won't need any of your "seagoing" gyro tripods for ship scenes, even if they're made in the studio tank! That one little experiment with my amateur camera helped me a lot, professionally, and probably saved the studio several thousand dollars worth of equipment. Do you wonder that I'm all for studio folks being cine-amateurs?"

Complete Roster at Date of Publication

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Struss, Karl —United Artists.
Stumar, John—Universal.
Stumar, Chas.—Berlin, Germany.
Sharp, Henry—United Artists, Doug. Fairbanks.
Schneiderman, Geo.—Fox Movietone.
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Zucker, Frank C.—Photophone, Inc., New York.

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25

Hope Hampton

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STAGE TECHNIQUE IN THE TALKIES

A Sound Engineer Presents Some Interesting Details and Observations Gained in a Varied Experience

By CARL DREHER

Director of Sound Department R-K-O Studios

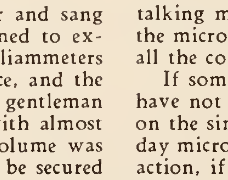
This article, appearing in the current issue of Radio News, reprinted through courtesy of the publishers.

Illustrations by J. Ronan

While the two groups are educating each other much money is lost—and a good many tempers.

WHEN one compares microphone technique on a sound moving picture stage with the corresponding manoeuvres in broadcasting, one notes many close parallels and, also, some salient differences. A microphone is a microphone, but it is one thing to be able to place it where one pleases, in relation to the performers, as in the broadcast studio, and something else again when the business of the play, camera angles, camera noise, and all sorts of dramatic consideration must be taken into account. Movie microphone technique, as a result, is more intricate and requires greater adaptability on the part of the specialists.

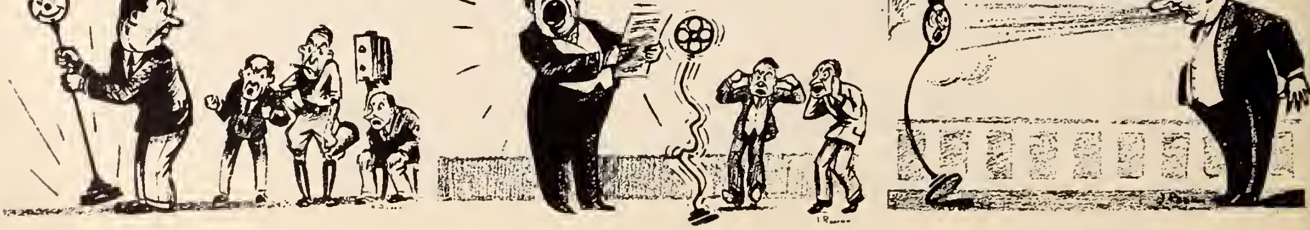
It should be acknowledged, however, that without the preceding experience of the broadcast rooms the job of the sound movie technicians would be insuperable. Not only did they learn their craft in broadcasting, but broadcasting taught the artists the amenities without which natural sound reproduction is impossible. It was in broadcasting that the cooperation between the performer and the technician, which is indispensable in this field, was first developed. The artists who first appeared in the radio studios took the idea that they should modify their execution for the sake of the microphone either as a personal affront or as a silly notion to be charitably ignored. I recollect my own experience with one of the great figures of the operatic world some five years ago, when he made his first bow to the radio audience. At the rehearsal he took his stand before the transmitter and sang with prodigious volume, such as he had been accustomed to exhibiting from the Metropolitan stage. The d. c. milliammeters in the microphone circuits did a hootchy-kootchy dance, and the control operators tore their hair. We explained to the gentleman that he was blasting terribly, that in a small room, with almost unlimited electrical amplification ahead, great initial volume was superfluous and injurious, and that better results would be secured if he would tone down his performance. After some snorting and argument in Italian with his manager, the artist graciously consented to make an effort to hold himself down. In the evening, however, he could not be restrained and the undeniable beauty of his voice was largely lost in transmission. Later on we found that an imbecilic scheme of the artist's press agent, probably abetted by similar mentalities on the station staff, was partly responsible for the colossal fortissimos which the great tenor flung against the quaking walls of the studio. It seems that a group of the artist's friends were assembled in Rome to hear him broadcasting in New York (the power was about 750 watts). Little as he knew about radio, he realized that the attempt was a desperate one, and he reasoned that the only chance of getting across was to sing as loud as possible. He therefore dismissed the counsel of the engineers, and did his damndest.



Help!

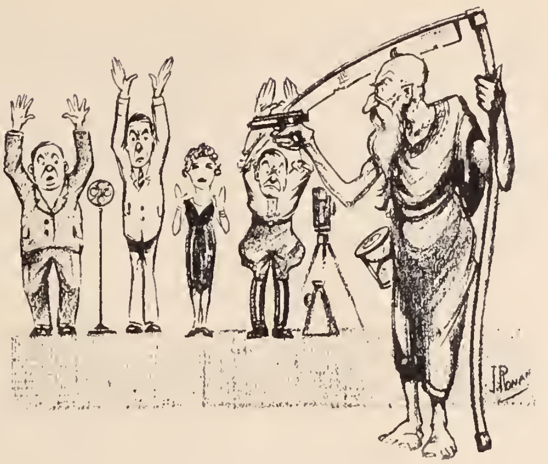
As broadcasting developed and stood on its own feet, a new generation of artists took the place of those of the older luminaries who had not shown themselves adaptable to the new order. These people developed a microphone technique which experience showed gave the best reproduction in the homes of the listeners. They realized that their reputations and future incomes were in the hands of the engineers, and instead of waiting for the technical people to correct them, they asked them how to do it right in the first place. Some of these artists made, and are making, an imposing lot of money. This intelligence being spread abroad through the musical and dramatic trade papers, a new attitude toward the microphone and its mentors was created in the entertainment profession generally. The happy result is that in the talking movie studios most of the actors are as eager to play to the microphone as to the camera, and the engineers get from them all the co-operation imaginable.

If some of the movie directors are less pliable, it is because they have not yet assimilated the broadcast viewpoint, which is based on the simple fact that the acoustic characteristics of the present-day microphone and its surroundings must be conformed to in the action, if the final product is to be successful. But this goes the other way also—many of the engineers have been slow in adapting themselves to the movie technique which preceded their entrance into the business and will in major degree survive it. Both parties must gain an understanding of technical limitations in photography and sound pick-up, not merely in one of these fields. The



He took his stand before the microphone and sang with prodigious volume.

situation which exists in many studios is that the sound engineers know the limitations of the microphone (even under the best acoustic surroundings which can be provided), while the cameramen and the directors who have been working with the camera men for years know the photographic limitations. The engineers ask for microphone placements which result in impossible camera angles; the directors want to photograph as in the past, and demand miracles in microphone work from the engineers. While the two groups are educating each other a good many tempers — and much money—are being lost.



The great bogey in the picture business is holdups in production.

In such situations the engineer, if he is to perform his task effectively, must be a practical psychologist as well as a sound technician. There are times when he must be firm and even severe. Experience shows that if he quietly accepts an impossible microphone placement, with merely a polite statement to the effect that the sound will not be good, he will be blamed later for the result. The director and the other functionaries will conveniently forget their part in the compromise, and intimate that the engineer just doesn't know his business. In the nature of studio activities, loss of confidence in any technician proceeds rapidly, once the process is started. The sound man must not let it start if he can help it.

Another peculiarity of studio psychology which he must be prepared to meet is that the law of identities does not hold between sound and picture. The law of identities, for the benefit of those who have forgotten their college courses in logic, is the simple proposition that a thing is equal to itself. Twenty minutes, for example, is twenty minutes—but not in a sound studio. There twenty minutes of delay caused by sound equals forty minutes of picture delay. If the sound engineer, with his hundred million-fold energy amplification following the microphone, is stopped for a few minutes by a noise which he cannot locate, a far more serious crime against the studio has been committed than when a camera man interrupts the shooting to have the lights changed. This is unfair, but perfectly understandable. In the first place the sound man is an alien in the studio, during the present period of adjustment, and judgments of him are likely to be more severe. But more than that, when he causes a break in production it is looked on as one more source of delay in a business which was already appalled by its losses resulting from delays. The great bogey in the picture business is hold-ups in production. The actual "takes" occupy a lamentably small portion of the time of the studio. Designing and building sets, rehearsals, placing and shifting of lights, changes in the action of the play, and now, microphone placing and amplifier adjustment, take up most of the time, and the actual photographing and recording which bring in the money are in the proportion, almost, of minutes to hours. And those hours, especially when the cast is ready and waiting, and all the grips and electricians and property men and directors and supervisors and the thirty-seven varieties of assistants with them, cost a dreadful lot of money. Nobody sees a few thousand dollars an hour going down the chute calmly, and the hysteria is at its worst when the sound apparatus is the cause of the loss.

Some delays the sound engineer cannot avoid; if, for example, he finds that with a given microphone placing he is not getting the best results, the action must usually be held up until the transmitters can be shifted. With even the shrewdest technical personnel on the job microphone placing is a matter of cut and try, and sometimes the first try is not good enough. But delays caused by failure of the equipment are intolerable in sound picture work, just as going off the air is in broadcasting. Some such delays will nevertheless occur, just as breaks on the air have not been entirely eliminated by even the best broadcast stations. A microphone becomes noisy, or some electrical disturbance is picked up, or a circuit opens somewhere. The remedy, as far as there is one, is careful testing. The equipment must be gone over each day before production is scheduled to start, from microphones to film, and its performance tested at all the essential frequencies. Voltages and currents must be checked, and any anomalies rectified before the damage is caused rather than afterwards. A good audio oscillator and a complete stock of meters has saved many a sound engineer's professional neck. If trouble, nevertheless, occurs, he must rely on his skill as a diagnostician. Most irregularities have their characteristic sounds, which can be recognized. During spare time they should, in fact, be deliberately produced, and such objects as a leaky condenser microphone, or a lead which meggers below the safety line, or a microphonic tube, have considerable instructional value in this connection.

The subordinate sound technicians should be encouraged to keep accurate logs, and when sound equipment causes a delay the precise loss of time, and the cause, should be entered. Such a record is often of value later, although naturally it is not the matter of primary importance, which is to produce high quality sound negative as fast as possible. The notation comes in handy after studio incidents like one I witnessed, where it was necessary to shift microphone positions, at the cost of about ten minutes. During this interval the director decided that the camera angles were wrong, whereupon the cameras were shifted and the lights changed. This manoeuvre was completed thirty minutes after the sound men had finished their job. Later sound was charged with the loss of forty minutes. The sound engineer protested to the producer and was able to prove by his records and other testimony that he was responsible for only ten minutes out of the forty.

In contrast to this sort of thing one may turn to an article on "Sound Men and Cinematographers Discuss Their Mutual Problems," in the August, 1929, issue of the *American Cinematographer*, the excellent journal published monthly by the American Society of Cinematographers in Hollywood. In the nature of things the camera men and the sound people get in each other's way. Be-

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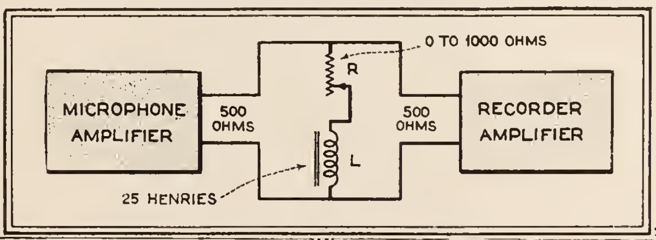

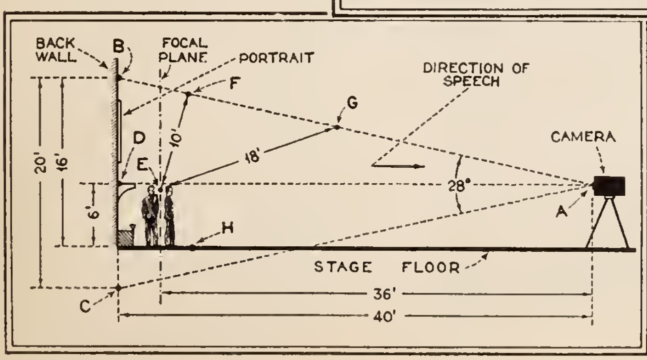

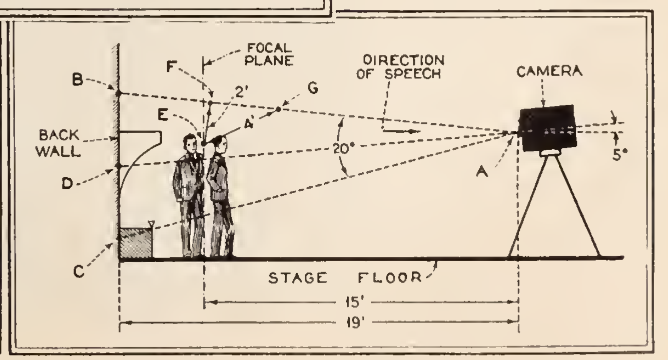

Left—Figure 1. Right—Figure 2. Above—Figure 3.

Multiple Exposure Cinematography In Sound Pictures

Lap Dissolves Again in Use As Cinematographers Master the Difficulties of Sight and Sound Photography

By WILLIAM STULL, A. S. C.

IT IS HARDLY more than a year since sound pictures took their place as the major part of studio production programs. In that year an enormous amount of progress has been made, alike in the artistic utilization of the new form, and in the technique of its operation. Studio personnel has grown increasingly familiar with the sound device, and this familiarity has resulted in the overcoming of many of the obstacles which the coming of sound was thought to have placed in the path of true screen technique.

An instance of this is the reappearance of such truly cinematographic effects as lap-dissolves and multiple-exposure work. A year ago they were regretfully dropped from the cinematic vocabulary due to the added complication of sound photography. Now they are reappearing, as cinematographers and recorders gain more assured mastery of the new medium.

Probably the first to reappear were the 'fade-out' and 'fade-in'. Screen technique demanded them. As a rule, they have been made chemically; but to cinematographers, chemical fades are rarely satisfactory substitutes for those made directly in the camera. Similarly, recording engineers greatly prefer to control the fades on their sound-tracks themselves. Therefore, in practically all studios, fades are now made directly in the camera and recorder. When recording with the Variable Density process, by means of a glow-lamp, the most satisfactory method has been found to be the gradual removal of the lamp to a distance from the film at which its light is no longer strong enough to affect the emulsion. While this could of course be done mechanically, it is at present done manually; very little practice being required to attain proficiency. When using the light-valve method, two courses are possible. One may either gradually stop down the lens of the recorder, or reduce the amplification from the mixing-panel. Both of these methods are also applicable to the Variable Area processes, while of course the only control possible for the disc system is through the amplifier.

Having mastered the technique of fading in and out in sound, it is not such a great step to combining and overlapping the fades, making a lap-dissolve. Still, it has proven quite an undertaking, as it offers rather more than double the complication and hazard that silent laps entail. None the less, it is a vitally important part of dramatic cinematography, and could not be overlooked; consequently, the majority of the studios are in one way or another accomplishing sight and sound laps with increasing frequency. Probably the easiest way of getting the desired effect is through the use of the optical printer and the making of duplicate negatives. This is, indeed, the general practice in the studios using disc recording exclusively. But dupes; unless made with a skill and care almost never found in the rush of commercial production, seriously detract from the quality of both picture and sound, and are naturally avoided wherever possible. A second method is to allow the picture to lap quite as though it were a silent film, while the sound merely fades in and out with unusual rapidity; for instance, if the complete lap were to run, say, eight feet, the sound would fade out in four, being immediately faded in on the next scene, also in four feet.

Double exposure of actor and voice in the Fox Movietone picture "Masquerade." Note sound track at left.—Photographed by Charles Clarke, A. S. C.

But this is so slightly removed from true lap-dissolving that the added trouble is negligible. Therefore, in most cases, true lap-dissolves are returning to favor in preference to other makeshift methods.

When using the Variable Density systems with glow-lamp apparatus, the procedure, as is the case in fades, is to withdraw the lamp from the recorder. Then the several films are wound back to the marked starting-point of the scene, and run forward, with shutters closed and glow-lamp withdrawn, to the point at which the dissolve was started, and the fade in is made in the usual manner. As a matter of actual practice, however, it has been found necessary to rewind only to the start of the fadeout, plus the footage necessary to regain speed—usually twenty feet. The writer recently spoke with a cinematographer who had on the same day made by this method a sequence involving four such lap-dissolves, without a single failure in the course of a half-dozen 'takes'. He had found it necessary, however, to recognize the human element in his problem to the extent of allowing for the inevitable lag in the recorder's response; for instance, if the fade were to come at the 40-foot mark, he would signal the recorder when the indicator read 38-feet, and then start his own fade.

When recording with the light-valve, the same general technique is followed, save that the sound is faded in or out by either the optical or electrical methods earlier mentioned. In the Variable Area system, the same general procedure may be followed, but there is an additional possibility, as well. The entire optical assembly may be gradually decentred with respect to the film, gradually reducing the magnitude of the serrated edges of the sound-track to their mean level. If this be done, moving the assembly to the left, for instance, and at the same time shielding the right-hand side of the track from exposure, the other half of the dissolve may be effected by similarly moving the assembly in from the right, and stopping it when centred. So far as is known, this latter possibility has not as yet been tried in actual production, though it is considered quite feasible from the theoretical standpoint.

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SOUND PICTURES THE SUCCESSFUL PRODUCTION OF ILLUSION

Extract from a Lecture Before the Sound Class of the Academy of Motion Picture Arts and Sciences

By WESLEY C. MILLER, M. S., E. E.
Chief Transmission Engineer, M-G-M Studios

This is the first of a series of articles on sound problems which Mr. Miller has prepared and which will appear in The American Cinematographer. Editor's Note.

WE AIM to produce pictures which will be successful when run in a large number of theatres. This success is measured in dollars and cents but back of this measure there is the necessity for a careful analysis of the many factors—creative and technical—which have gone into the work. Most of us believe that, generally speaking, the story told by a picture contributes largely to the reception which it receives. This is tempered by the treatment which is given in the direction, and especially in the editing. The more technical factors of photography and sound naturally are of importance, but greater perfection of them has the effect of merely enhancing the value of an otherwise good picture. Good photography or sound have rarely salvaged a poor picture. On the other hand, poor quality of either, or both, has made many an otherwise good picture mediocre or poor as presented to the audience. If such degradation of a product is possible, and we all know that it is, it is well worth our while to find the causes of trouble and the possible methods of relief.

A great deal could be said on the subject of the story itself and the method of presenting it. Naturally, each type of story lends itself to a different treatment. Before the advent of sound, the motion picture art had reached the point where a great portion of the tremendous appeal of the picture came from the fluidity of motion of the action. The ability to cut from place to place, to recognize no limits of time or space, had made it possible to play upon the imagination of the audience to the point where they were almost in the scenes depicted before them on the screen. This done silently or with suitable music left their minds undisturbed by anything but the picture, which, if at all good, could completely carry them away. Along with it all, however, it was still quite possible to talk or move around without losing enough of the sense of the picture to make it uninteresting.

Sound immediately introduced a complication which is largely psychological. If much of the story is told by the spoken dialogue it becomes practically imperative to maintain silence and to pay strict attention to every word. This demands concentration to a degree which is often not relished by an audience which demands a method of recreation which permits more relaxation. It will readily be granted that the motion picture audience, taken by and large, is definitely different from the one which attends the legitimate stage or even the musical comedy. These people go with the distinct knowledge that they will have to pay attention to every detail and will even have to strain a bit to get it all.

The adaptation of our new medium to the audience is a problem which must be answered in two ways. In the first place the audience will to some extent fall into the habit of learning how to enjoy our products. Whether they will do it as enthusiastically as they used to no one knows. Secondly, the producers have the artistic and technical analysis to make of what will best work out under these new conditions. This will not be the filming of stage presentations per se nor the attempt to merely introduce sound or dialogue into a picture handled on a silent basis. It is evolving now, as we know, and will result in a combination of the arts of each of these branches which will attain success never dreamed of for any one alone.

We perhaps dislike admitting it in public, but it seems to be a fact that the most natural appearing results obtained in this business are quite apt to be the result of intelligent and studied artifices. Some of these are pure genius. This condition has not come about accidentally, but has as its cause the limitations which have been found and recognized in the various devices now available for production and reproduction. These limitations will become less severe as time goes on, but to some extent will always exist. We create artifically the effects of stereoscopic photography, we exaggerate perspective or we attract attention to some person or object through the device of the close up. Each time as we do this we keep in mind the probable effect which is to be produced in the theatre.

With sound our problem is identical. The very best thing we can hope to do is to produce rather imperfectly the illusion that the real thing is before us. If we can do this well enough to hold the auditor and to make him forget even temporarily that he is not seeing and hearing the original, we have gained our end.

Suppose we review the factors which affect us. If we have before us on the stage a person singing or talking the very best we can hope to do is to get most of what is going on. Unless we sit in the first few rows we can practically never get it all. Fortunately our various faculties all work together in such a way that we piece together all of the various bits which we see and hear and thus gain an understanding of what is going on. If now we enlarge that which is on the stage to the size prevalent on the screen, and if we similarly amplify the sound to just nicely fit this enlargement, we have made an important step in assisting both our sight and hearing in keeping track of the progress of the act. There is an important provision in this, however. The amplifiaction of the sound must be just enough to fit the picture size. Probably the best way to express this is to say that any combination of picture and sound must be so proportioned that the latter sounds natural

A Beauty Spot in Utah—Photographed by Dan Clark, A. S. C.

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Machine for Cutting Master Disc Records

A Paper Presented at the May, 1929, Meeting of the Society of Motion Picture Engineers

By L. A. Elmer and D. G. Blattner
Bell Telephone Laboratories, Inc., New York

THE machine used in recording sounds on phonograph discs synchronously with associated pictures consists essentially of a turntable, bearing the "wax" and rotated by a synchronous motor of constant speed, and an electrically driven stylus cutting the record. In the design of this machine the primary aim is to ensure that the record is both faithful to the original sounds and synchronous with the pictures. Fidelity in the performance of the stylus would be vitiated by departures from uniformity in the speed of the turntable while sounds were being recorded or reproduced. Although a constant speed motor is used, its value would be destroyed if the machinery transmitting the drive motor to turntable were not equally free of velocity variations. Thus the problem of fidelity involves not only the motor and the stylus but all the moving parts of the machine.

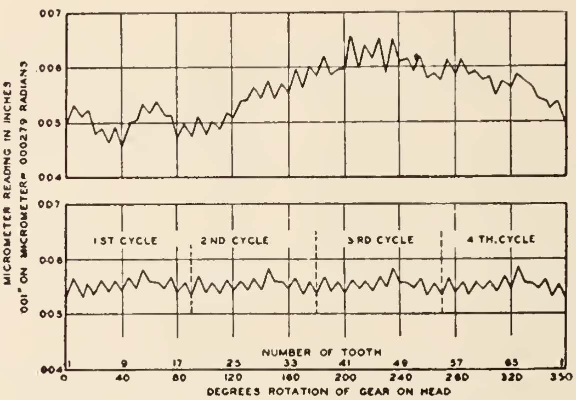


Figure 1

Even were it possible to connect the motor directly to the turntable, casual variations in the speed would arise, from varying frictional loads on the turntable and bearings. But direct connection is unsatisfactory. Because the turntable must operate at a lower speed than the motor (one thirty-sixth of that speed), reducing gears must intervene. In the actual apparatus, the motor drives (through a horizontal coupling) a worm engaging a worm wheel which drives (through a vertical coupling) the shaft to which the turntable is attached.

It is cyclic speed-change that must be guarded against in this mechanism; all such changes with frequencies from about one-half cycle per second up to the higher limit of audibility are to be avoided. Speed changes at audible frequencies introduce extraneous sounds into the records, and speed changes at frequencies below the audible range produce changes in pitch. There are in general two points of origin for these variations; the turntable and its bearings, and the gears. Speed-changing variations in load on turntable and bearings are most likely to have the frequency of the rotation of the turntable (a little more than one-half cycle per second). From the gears three sorts of variations arise; those accountable to inaccuracies in the spacing of the teeth (Figure 1), to errors in the shape of the teeth, and to the successive shifts of driving load from tooth to tooth. Together, these may occasion variations with quite a range of frequencies.

The extent to which these variations are permissible is determined, for low-frequency changes, by the smallest change in pitch the ear will notice when pitch-variation is continuous. It appears that, when a pure tone is projected by a loud speaker of high quality, the ear can detect variations in its pitch which exceed one-tenth per cent of its frequency. This sets a severe requirement for constancy of rotation.

It is, furthermore, an overall requirement, for it applies to differences between the original and reproduced sound; and both a recording and a reproducing machine intervene between these sounds. Since both operate at the same speed, and since there is a high probability that the ultimate record will be lined up on the reproducer correspondingly to the "wax" on the recorder, variations in the speeds of the two are likely to be additive in their effects upon sound pitch. The sum of the variations permitted in the two, therefore must not be greater than the total permissible variation for the system as a whole. Since the more its velocity characteristics are made constant the more the apparatus costs, it is economical to be stringent in requirements for constancy in the recorder, of which comparatively few are manufactured, the more lenient in those requirements in the more numerous reproducers. An economical division between the two machines of the total allowable error appears to be in the ratio of one to four. The demand for constancy thus placed upon the recorder is far higher than can be met by gears and bearings of even the most careful construction. It is a demand which can be filled only by special means.

A motion of this sort can be treated as a uniform rotation on which a small reciprocal motion is superposed. The reciprocal component can be suppressed, therefore, by a vibration-absorber rotating as a unit with the entire apparatus and absorbing the relative reciprocal motion between its parts. This absorber, or

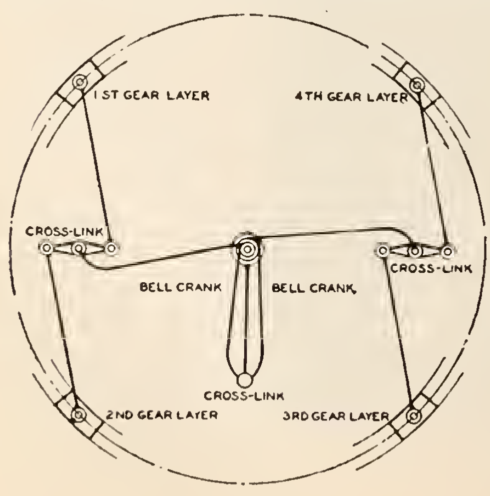
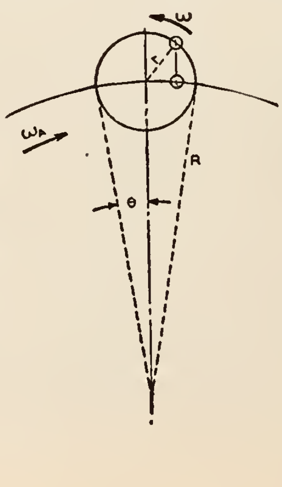


Figure 2



ω_A = Av. Turntable Vel.

$\omega_A + \frac{\omega_r}{R}$ Max. Turntable Vel.

$\omega_A - \frac{\omega_r}{R}$ Min. Turntable Vel.

ω = Angular Eelocity of Vibration $= 2\pi f$.

$2\frac{\omega_r}{R}$ = Velocity Varation

$200\frac{\omega_r}{\omega_A}$ = Velocity Var. in per cent

$$200\frac{\omega_r}{\omega_A R} = 200\frac{\omega}{\omega_A}\theta$$

θ = Amplitude in Radians

When $\frac{\omega}{\omega_A} = 1$, $\quad 200\frac{\omega_r}{\omega_A R} = 200\,\theta$

Figure 3

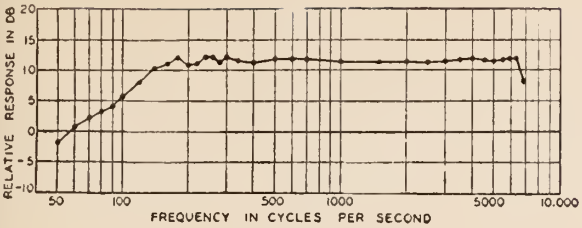


Figure 4

"filter", can be made of masses, springs, and dissipative plastics, suitably combined in accordance with dynamic theory.

Such a filter, designed in Bell Telephone Laboratories, is incorporated in the Western Electric Company's commercial disc-recording apparatus. It uses coil-springs as its capacitances, viscous oil for its resistances, and the masses of its moving parts as its inductances. The great width of the frequency band to be attenuated, and the plurality of the sources of the varying force, considerably complicate the problem of determining what values of stiffness, weight, and dissipating ability should be used. For example, variations due to gear inaccuracies are most readily absorbed by very flexible springs, whereas disturbances due to varying loads are best prevented from affecting turntable speed by the use of stiff springs. The filter finally designed embodies a compromise between these conflicting demands. Its general construction is such that the worm-driven gear drives the turntable shaft through the linearly flexible springs, and relative motion of the gear and shaft is damped by the oil.

The gear is made in four layers. These layers are clamped together when the teeth are cut, and each layer is afterwards rotated ninety degrees relative to the adjacent layer. All are finally mounted, in engagement with the worn wheel, so that each can move independently of its companions. To each layer two cross-braced posts are rigidly attached, from the tops of which springs lead to lugs on a plate fastened to the turntable shaft. Thus each layer of the gear independently drives the shaft through two springs. It is apparent that the offset four-layer structure of the gear divides by four the amplitudes of the disturbances caused by inaccuracies in the teeth, since at any one time, each affects but one of the four sets of springs. This structure also multiplies by four the frequencies with which these disturbances occur since each inaccuracy in cutting is made to occur once for every 90 degrees, instead of once for every 360 degrees, of rotation. This higher frequency is far more readily absorbed by the filter than the lower would be.

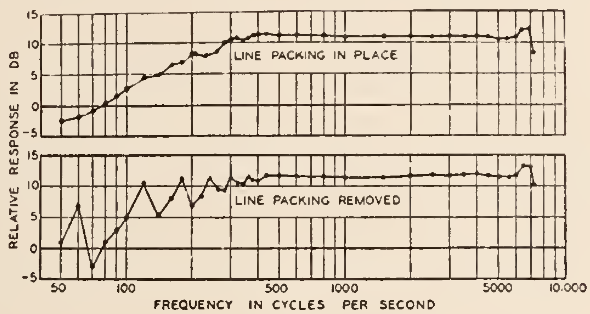


Figure 5

The oil connection between gear and turntable shaft is effected by permitting the layer-gear to rotate a vane-bearing oil-filled cup, into which dip vanes attached to the turntable shaft. The mechanism through which the gear drives the cup is in this case rigid rather than elastic, but is again one whereby the effect of a gear irregularity upon the cup is quartered in amplitude and quadrupled in frequency. This mechanism is a system of links independently driven by each of the layers of gear so as jointly to rotate the cup with the average velocity. To each layer, again through the perpendicular posts, is attached a link (Figure 2). The members of one and the other pair of these links are flexibly joined by cross-links, to the center of each of which is pivoted one end of the bell-crank. The other ends of these two bell-cranks are in turn flexibly joined by a third cross-link, to whose center the member which drives the cup is attached. It is apparent that the motion of the center of each cross-link is the average of the motions of its two ends. Each of the first two cross-links, therefore, averages the motions of two of the gear-layers, and the third cross-link averages the motions of the first two cross-links, driving the oil cup with the average motion of all four gear-layers.

Because the deflections with which this apparatus is expected to operate are very small, it is essential that no motion be lost by "blacklash" in pivots. For this reason, and to minimize pivotal friction, flat reed-springs are used for all joints. Since the linkage cannot be constructed in a single horizontal plane but must be built in several planes, it is subject to warping forces which tend to produce many undesired motions. To avoid these, the linkage is extensively braced.

In the development of this filter, reliance upon theory had to be supplemented by measurements of the effectiveness of various models. Since smooth rotation of the turntable was in view, fluctuation in turntable speed was the performance to be directly measured. This was accomplished stroboscopically. On the rim of the turntable 216 accurately spaced grooves were cut. A disc, with six radical slots, was connected by a rigid drive to the shafts of the synchronous motor. The disc was so placed that the grooves on the rotating turntable could be observed one by one by a microscope looking through the slots in the rotating disc. Observed through this apparatus, the groove on the edge of the rim appears to stand still when the speed of the turntable is exactly one thirty-sixth the speed of the motor. A small error in turntable speed causes the image of the groove to change position momentarily. The amount of this shift can be read in thousandths of an inch on a filar micrometer placed in the eye-piece of the microscope. From this reading the per cent velocity variation can be calculated (Figure 3).

The model finally developed drives the turntable with remarkable constancy. Of the velocity variations from the two major sources of error—form varying loads, at one cycle per revolution, and from varying gear-spacing, at four cycles per revolution—the former has been reduced to 0.04 per cent and the latter to a point below the limit measurement. Supplemented by suitably modeled drives for reproducing machines, recording drives of this type provide ample insurance against maltreatment of sounds by driving machinery.

Discussion Pertaining to D-85264 Recorder and 6-A Reproducer

The purpose of the turntable and other gear described is of course only the means to an end. They are essential in order that the recording instruments may perform their intended function.

The recorder and reproducer, the instruments referred to have been described in previous literature but further discussion in regard to certain features of design and usage may be of interest at this time.

Recorder

The technical features of the recorder will be considered only in so far as is necessary to bring out the points under discussion.

For present purposes, the transmission system used in disc recording can be described as a transmitter directly connected to a recorder. In such a case, the transmitter (microphone and other transmitting apparatus) used for picking up the sound, may be considered as a constant resistance device which, when subjected to sound pressure waves, generates an alternating voltage proportional in magnitude to the sound pressure and of the same frequency; and the recorder may be considered as a device actuated by such a transmitter to produce an engraving in a wax, the wave form of the engraving having the same frequency as the transmitter voltage.

It is obvious that in such a system only a portion of the transmitter voltage is effective to drive the recorder. It is necessary

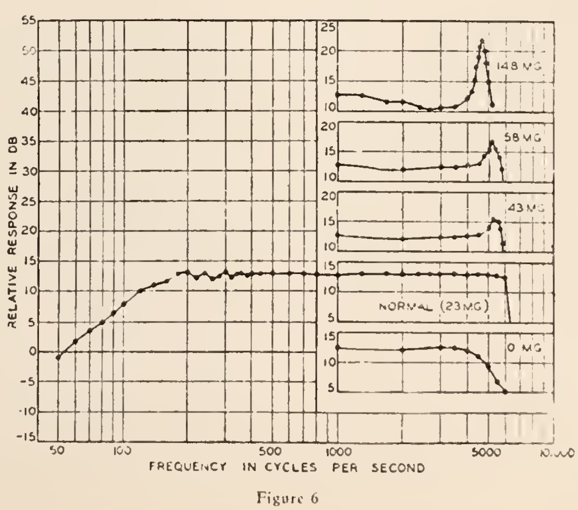


Figure 6

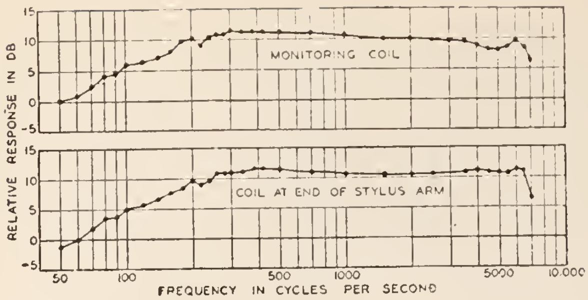


Figure 7

that the recorder should produce an engraving that bears some simple relation to the transmitter voltage, since this voltage is proportional to the sound pressure. With a perfect recording and reproducing system, the sound power reproduced from the record would be proportional to the sound power available for recording; and if the air load on the sound reproducer (or loud speaker) is of the constant resistance type, then the simple relation between the performance of the recorder and the transmitter voltage referred to above may be expressed as

$$V = Kv.$$

Where V is the transmitter voltage v is the vibrational velociay ($2\tilde{n}fa$) of the engraving and K is a constant. Except as other considerations make it necessary to depart from such a relation, this equation then may be taken as the required performance characteristic of the Western Electric D-85264 type recorder.

It will be obvious from equation (1) that the factor K can have any value and still fulfill the requirements as to perfection of performance; the only further requirement in this respect is that a suitable value of v shall result from the combined action of the transmitter and recorder to make the subject matter of the record stand out sufficiently above the incidental noise. In other words, K merely indicates the combined transmitter and recorder sensitivity required for a given sound loudness available for recording. If the transmitter sensitivity can be varied at will, then the recorder sensitivity can be allowed to vary, provided the magnitude of the variation does not impose additional requirements on the transmitter. In the case of the Western Electric recording system, the 394 transmitter and associated amplifiers are considered as the transmitter. There is, therefore, no need of the recorders being alike in sensitivity, and as a matter of economy in manufacture, no considerable effort is made to have them so. In fairness to the recorder, however, it might be said that the magnitude of the magnitude of the manufacturing variations permitted is so small that the device would have been considered uncommercial a few years ago.

From what has been said, it probably has occured to the reader that variation in sensitivity if the recorder product is of less importance than variation in shape of sensitivity characterstic for various frequencies. It is distinctly desirable that the same quality of reproduction be obtained from records cut by different instruments. To this end, a variation in shape of the sensitivity characteristic of any recorder, throughout the frequency band of interest in excess of $\pm$ 1 db[b], is not permitted; whereas, as variation of $\pm$ 3 db between different recorders at any particular frequency is considered satisfactory. Figure 4 shows a typical sensitivity characteristic of the D-85264 recorder.

In order to obtain such a degree of precision in sensitivity of recorders manufactured by the Western Electric Company, it has been found necessary to go to some considerable pains in assembly and adjustment. For instance, the rubber line must be carefully chosen as to mechanical properties and must be carefully packed in the housing. Once properly assembled and adjusted, however, experience with a considerable number of recorders now in service indicates that further attention is rarely necessary, provided the instruments are handled with reasonable care. Proper selection of the rubber line and proper assembly and adjustment are determined by sensitivity measurements at various frequencies rather than by visual observation, and under no consideration is it recommended that adjustments or repairs affecting the rubber line be attempted in the field. Fig 5 shows the effect upon sensitivity caused by improper packing of the rubber line.

A further point in this connection has to do with the stylus. The recorder was designed to be used with an average cutting point weighing about 25 milligrams. It is obvious that if the point is not of the proper weight or if it is not mounted n proper relation to the stylus arm, a typical response curve cannot be obtained. Fig. 6 shows the effect of the weight of the recorder point upon the shape of the sensitivity characteristic of the device.

The proper position of the stylus point is one for which the tip extends beyond the end of the stylus arm from 1/16 to 1/10 of an inch.

In order to facilitate determination of the sensitivity of the recorder at various frequencies, a new calibrating system has recently been designed which replaces the optical apparatus previously used for this purpose. The use of the new system involves only such technique as is already familiar to amplifier maintenance people. The scheme consists in replacing the stylus point by a small coil of equal effective mass, operating in the gap of the magnet in such a way that the motion of the stylus arm induces a voltage in the coil proportional to the velocity of the arm. The technique of making a response determination consists in comparing the coil voltage to the transmitter voltage in much the same way as in the measurement of amplifier sensitivity.

In connection with the calibration of recorders it is important to know something as to the purity of the wave form of the groove cut by the recorder. A considerable harmonic content in the wave form might defeat the whole purpose of the calibration. In consideration of this point, it is to be expected that in a magnetic system, in which all the reluctance is concentrated at the air-gap and in which a preponderance of the total armature flux results from the steady magnetomotive force, a condition of saturation would result when the gap is momentarily reduced a sufficient amount. In the Western Electric recorder, considerations as to the flux density in the gap and premeability of iron lead to the conclusion that the harmonic generation would be small for stylus displacements of as much as 10 mils or more, whereas the maximum displacement permissible from the standpoint of the record is only about 2 mils. Experimental data indicates that when driven at a frequency of 50 cycles and an amplitude of 4.6 mils the harmonics are of the order of 30 db below the fundamental.

In connection with the D-85264 recorder, a new feature has recently been worked out by means of which it is now possible to monitor from the stylus rather than from the bus bars of the amplifier which feed the recorder. As pointed out, the response of the recorder at low frequencies is somewhat less than at the higher frequencies, and therefore the character of the monitoring reproduction by the two methods will be different. By monitoring on the stylus arm, it is now possible to hear, when recording, what the finished hard record, made from the wax being cut, will be like. It is felt that monitoring in this way should make it possible to more accurately judge the balance of the subject matter and so result in a more constant product and in saving of time and expense. The monitoring device consists of a coil and magnet similar in construction to those described for the response measuring system, but differing, in that the monitoring apparatus is supplied to the stylus arm at a point about midway of its length. In applying the monitoring device to a recorder it is necessary to alter the arm somewhat in sectional area and length in order to obtain the proper overall effective mass; but the effect of the alternation upon sensitivity is negligible. Fig. 7 shows a response characteristic of such a recorder, when measured in the usual manner and also when measured by means of the monitoring device. It will be obvious that the

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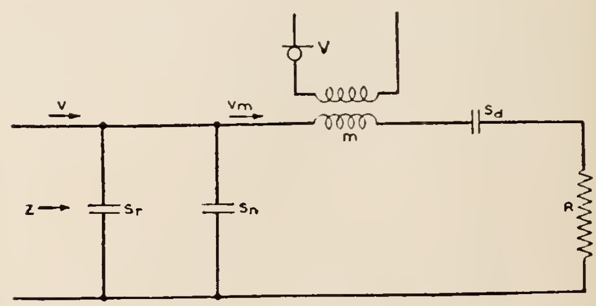

V = GROOVE ANGULAR VELOCITY
V_m = ARMATURE VELOCITY
V_m/V = CONSTANT
R = DAMPING RESISTANCE
S_d = DIAPHRAGM STIFFNESS
S_r = STIFFNESS OF WAX
S_n = STIFFNESS OF NEEDLE

$$S = \frac{S_r S_n}{S_r + S_n}$$

ALL VALUES EFFECTIVE AT GROOVE

Figure 8

Multicolor Introduces Improved Color Film

New Rainbow Negative Promises Color on a Black-and-White Basis

By WILLIAM STULL, A. S. C.

ALTHOUGH it sometimes seems as though every innovation in picture-making is hailed as the most significant development of its time, there can be little doubt but that right now the increasing use of natural color cinematography is the paramount question. Sound has become an accepted part of production, and wide film and television are still beyond the horizon; but color is unassailably the topic of the hour. It is here to stay, for audiences everywhere are demanding it as the final touch needed to give life to the talking screen. Therefore screen technicians everywhere are taking a profound interest in everything calculated to bring color cinematography into equality with monochrome as a production process.

In view of such a condition, the very recent introduction of the new Multicolor *Rainbow Negative* is of far-reaching importance, for it brings an already highly perfected process into exact production equality with existing monochrome practice. It obviates the use of special cameras or additional lighting. In short, it attains the goal for which technicians have striven since the birth of the industry—*perfect color, on a black-and-white production basis.*

While the Multicolor process itself is so well known in Hollywood as to make a detailed description seem unnecessary here, it may be well to digress for the benefit of readers located elsewhere. Multicolor is at present a two-color, subtractive process which may be employed in any standard motion picture camera using demountable outside magazines. Aside from the use of a special double magazine, and a slight adjustment of the film-gate, there is absolutely no alteration to the camera. The prints may be projected in any standard projector. The secret of the process is its double negative which serves at once as film and filter.

Instead of securing the two necessary color-separation negatives by the use of prisms or rotary filters, Multicolor uses two films, which are exposed together, with their emulsion surfaces in contact. The front negative records the blue-green components of the scene, and has incorporated in the outer surface of its emulsion an orange-red dye which is photographically equivalent to the No. 23-A Wratten filter, and acts as such for the rear film, which is practically a standard Panchromatic, and records the orange-red components only. Since no prisms are used, the negative images are naturally in perfect register, and can be made critically sharp. Since they are made simultaneously, there can be no 'fringing.' The laboratory treatment of these twin negatives is exactly identical to that of black-and-white negatives. The prints are made on a special, double-coated positive stock. This has an emulsion coated on either side, in each emulsion being also a yellow dye to prevent the fogging of the opposite print. The print is developed in the normal manner, and the two sides are colored, one orange-red, and the other blue-green. The actual toning process used is an ingenious combination of chemical and dye-toning, selectively coloring the respective images. Since the print is not made by dyestamping, and since the original negatives can be made perfectly sharp, a Multicolor print can be made as critically sharp as could be desired. When colored and dried, the print is carefully varnished, and is thereafter ready for duty. This varnishing process is of the utmost importance, for it not only protects the emulsions, greatly increasing the useful life of the print, but also protects the sound track from the dirt, scratches, and abrasions which so frequently ruin the sound far ahead of the picture.

In this printing process, an amazing amount of control can be exerted over the qualities of the finished picture. Not only can the overall density of the print be varied, as with black-and-white, but the color balance as well. While, obviously, there is only *one* "right" balance of color for any given scene, in case of need the balance can be artificially altered to fit the mood; an increase of the red print tending to warm the scene up, and an increase in the blue to cool it.

The new *Rainbow Negative* does not alter any of these processes, but serves to improve the color rendition very noticeably, and increases the overall sensitivity of the process to exact equality with black-and-white. This makes it possible to handle Multicolor in production in exactly the same way as black-and-white. *Anything that is possible in monochrome is equally possible in Multicolor with no other change than the use of Multicolor films and the adjustment of the camera gate to accommodate the two films.* No additional lighting is required, nor any special arrangements: every lighting effect used in normal production can be used unchanged in Multicolor. Extreme high-key and low-key lightings can be used exactly as in monochrome, as can every imaginable trick of artistic camerawork, including glass shots and front miniatures. In addition, by the use of colored gelatines on the lights, an almost unlimited range of absolutely new artistic effects can be produced.

The writer has seen a number of such shots, the beauty of which so far transcended anything heretofore accomplished in either monochrome or color, as to convince him that an entirely new field for artistic cinematography has been discovered. One scene in particular is memorable: representing a medieval prison cell, and photographed in extreme low key, the interplay of the cold, blue moonlight shining through a barred window upon a beautiful woman within, and the mellow, golden glow of the candle-light from within the room was without doubt one of the most strikingly beautiful scenes ever put on the screen—and one which would be impossible by any other method. Close-ups, made either with or without a diffusion-disc, were so startlingly natural that it was hard to believe one was looking at mere colored shadows.

The extreme latitude of the process was well demonstrated by some scenes taken late in the afternoon on an extremely shady street-set, but in which the shadows were full of detail, and the highlights none the less absolutely natural. Another scene, made in the desert, pamming around from a very flat front-lighting to an almost complete back-light, showed even less change of density than monochrome would under the same circumstances. But the

(Continued on Page 23)

Ross Fisher, A. S. C., and William Williams

As the Editor Sees It

Merry Christmas!

AS THIS edition goes to press Christmas is rapidly approaching and little children are, in their childish scrawls, writing to Santa and are anxiously waiting Christmas morning when they can rush to the tree and open their packages and fill the homes with shouts of glee.

A beautiful day is Christmas—the birthday of Jesus Christ, our Lord. For most of us it will be a happy day this year. But, how about those others who, weighted down by poverty and sickness, will awaken Christmas morning to just another day of suffering, perhaps hunger?

How many of us will stop in our own selfish, mad rush to give those people a kindly thought? How many of us will remember that there are thousands of little children with broken hearts and empty stockings, perhaps empty stomachs.

Throughout the world there are wonderful organizations and groups of workers who are now raising funds with which to help make Christmas happy for these children. Have *you* given *your* contribution to such a worthy cause? If you have not, may I suggest that you hurry now and send your check to whatever group is handling the poor in your locality. Jesus gave his life for us. Surely we can give something, if only a dollar, to make some child's tears turn to laughter on Christmas morning.

Years ago this writer, then on the staff of the *Boston Post*, worked several weeks on the Post Santa Claus staff. All night on the night before Christmas we delivered packages to the squalid homes of the poor in Boston. Daylight came and we were still at it.

Shortly after three o'clock on Christmas afternoon I climbed the dark stairs of a tenement in the north end to deliver my last package. As I entered the one room those people called home—well description fails me. Three little half-clad children clinging to their mother's skirt, brushed away the tears and rushed at me as though I had come from God.

"I told you Santa would come," sobbed the mother. Perhaps most of us would be less selfish if we could all step into homes like that. Perhaps all of us would lend a helping hand and Christmas might be a bit more cheerful.—H. H.

Pictures as a Business

SOME idea of the enormity of the motion picture business, and its tremendous growth may be gained from the remarks of Will Hays made in New York recently. The figures are positively staggering when you realize that the industry is so young.

Capital invested in the business is now $2,-500,000,000; 150,000,000 feet of negative film used annually; 325,000 persons employed; 1,500,000,000 feet of positive film used annually.

And to think that only a few years ago the business was a nickelodeon affair!

The Stock Market

THE stock market crash is over, we hope; and thousands of men who threw caution to the winds have had their fingers burned. Thousands of homes have been made sad for Christmas because men still believe they can rush into the greatest gambling Casino in the world and win out over experienced men.

For some it has probably been a real lesson. Others will never learn, but will dash back as soon as they can gather together sufficient funds—and get burned again.

Human nature is peculiar. Men who know that money wisely invested in mortgages, sound business, good bonds or in outright ownership of excellent stocks eagerly lay this money down on a margin basis and hope against hope that prices already far above reason will go higher. A paper profit will be in their hands but they become insane with the greed inspired by getting something for nothing with the result—"wiped out." Some day they may learn to follow in the footsteps of the insurance companies and take a legitmate profit on a sound and safe investment.

Multicolor

WITH practically no tooting of publicity trumpets, Multicolor has been very quietly and effectively forging ahead in recent months until today it stands forth as a really important factor in the motion picture field of color. It is now a process that will, without doubt, wield a big influence in the industry, for it has passed the experimental stage and is meeting the tests of a critical industry unfailingly.

The progress of this color process has been truly remarkable. Some of the things accomplished are feats any color process owner should be proud of. For example, high speed pictures in natural colors have been made with startling effectiveness. In the matter of lights, recent tests made by the Multicolor officials revealed the fact that using first 500 amps, then 800 amps, and then 1300 amps, equally fine results were obtained. No great flood of light was necessary.

Disraeli

SOME idea as to the possibilities in talking pictures may be gained from Warner Brother's magnificent picture, "Disraeli." Here is a real talking picture. A picture that has no courtroom or back-stage scenes; a picture that is an example of what can be accomplished if a real effort is made to combine genius in story, cinematography, sound and acting.

George Arliss, always wonderful on the stage, is more wonderful on the screen in this splendid picture. Truly, one cannot imagine this picture in a silent version. It is one that needs the voice of a man like Arliss, and he uses that voice in a way that should make this one of the outstanding pictures of the year.


WELL NEIGHBOR LOOKS LIKE— YOUR GOING TO HAVE A 1930 BUMPER CROP
YOU AIN'T SEEN NOTHIN' YET— FOR EVERY ONE'S A FOUR-LEAF CLOVER
GLENN R KERSHNER A.S.C.

TALKING FOR HEALTH

Talking Pictures Have Already Taken Their Place In the Battle to Aid Humanity

By THEO. H. SIERKS

Division of Health Education, Los Angeles County Health Department

GOO-SKLIMP, Yimmy 'ike wa-wa," large splashes accompany this little speech.

No, it is not the 1930 Wampas starlets being featured in a new talkie, it is just little Jimmy performing before the motion picture camera and sound instruments as a demonstration of the proper method of being bathed in order to grow up to be a healthy speciman of manhood.

The first public health talkie, recently filmed at the new East Side Health Center of the Los Angeles County Health Department, promises to be a remarkable success as a method for the presentation of health education to the public in an interesting and an entertaining manner.

A short talk by an experienced nurse, an enlightening demonstration of proper diets by a trained nutritionist, some valuable pointers on the maintenance of good health by a child hygiene physician, and the modern mother may receive first hand health instruction on the silver screen from reliable sources in a manner designed even more for entertainment than for education. This is the new plan of the public health program of Los Angeles County, California, the home of the motion picture industry and of the largest county health department in the United States.

It is because of the wide territory covered and the large population served that the county has resorted to the products of the film industry in its endeavor to make "health" the password in Southern California. Talkies promise to popularize public health by developing the human interest appeal with the result that health will become a habit. Human interest in public health has not been lacking; it has lain dormant for centuries, waiting for some method of presentation to the people.

Twenty-five robust youngsters from nine to eighteen months of age in individual porcelain tubs splashed merrily to the tune of their own bathroom ballads during the outdoor bathing scene staged in the court of the East Side Health Center, little realizing that their every sound and motion was being accurately recorded by "mike" and lens, later to be heard and viewed in distant showhouses throughout the United States, Canada, and possibly Europe. A nurse, demonstrating with a live model, showed the correct technique in keeping the little bodies cleanly and healthy. Mothers stood behind their infants and followed each direction given by the skilled instructor. The class is ordinarily held indoors but warm weather often makes it more enjoyable in the open air.

Checking weight and height

Cameraman, sound technician, and director of the Hearst Metrotone Newsreel agree that the necessary clowning, gesticulations, and facial contortions for the benefit of the temperamental little actors and actresses might make a passable silent comedy in itself. This outfit has filmed the world's most renowned personages but it expresses the opinion that never before was tact and diplomacy so necessary to the success of a newsreel. Mary Anne wanted to eat her soap; Jacky wanted to drink his bath water; Buster had an undeniable desire to crank the camera himself; Doris would like to chew a while on the wash rag; Dorothy Jeanne wanted the gold-piece on the director's watch chain; and Junior just wanted to splash everyone, including the camera during the close-ups. Despite the wide variety of whims and fancies, however, each model behaved as a regular trouper and posed like a mannequin when the 200-pound camera and microphone was demounted from the tripod and wheeled on a hospital stretcher wagon along the row of bath tubs for the final close-up.

Other phases of child hygiene were dwelt upon in a short talk by Dr. Anna E. Rude, director of the bureau of child hygiene of the county health department and now temporarily located in Washington, D. C., having been requested by Secretary of Interior Dr. Ray Lyman Wilbur to attend President Herbert Hoover's conference on child health and protection.

The absence of sound with this type of a picture would make it almost valueless. The verbal instruction and the "coos" (possibly other vocal noises), especially, make it of interest to young and old, men and women.

Dr. John L. Pomeroy, Los Angeles County health officer, has already developed the use of the silent motion pictures to a considerable extent in his program of health education but certain limitations have acted as barriers to further progress. The library of the health department contains one-reel films of such subjects as "The Story of Water", "The Story of Bread", "The Hygiene of Recreation", "The Story of Milk", and other topics dealing with dental hygiene, sanitation, personal hygiene, and features showing various activities of the health department. Expenses for filming were defrayed, for the most part, through the co-operation of local dairies, bakeries, and water companies who were interested in informing the public of hygienic methods of production. These films contain no advertising but are of a purely

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Here are the babies being properly bathed while Talkies are being made to show other mothers proper health methods. Also skilled nurses lecture on weights, etc.

General Electric Builds World's Largest Mazda

WHAT is claimed to be the largest incandescent lamp ever constructed has been completed recently by engineers of the National Lamp Works plant of the General Electric Company at Cleveland, Ohio.

Information regarding this giant bulb has been filtering into Hollywood for some time, so when Peter Mole, of Mole-Richardson, Inc.; Frank Graves, chief engineer of Universal Studios, and Fred E. James, Sales Engineer of the General Electric Company, were on their way to the S. M. P. E. convention at Toronto, they stopped off to see it. The enormity of the lamp, unbelievably huge, took their breath away. They expected to see something unusual but nothing like what was placed before them.

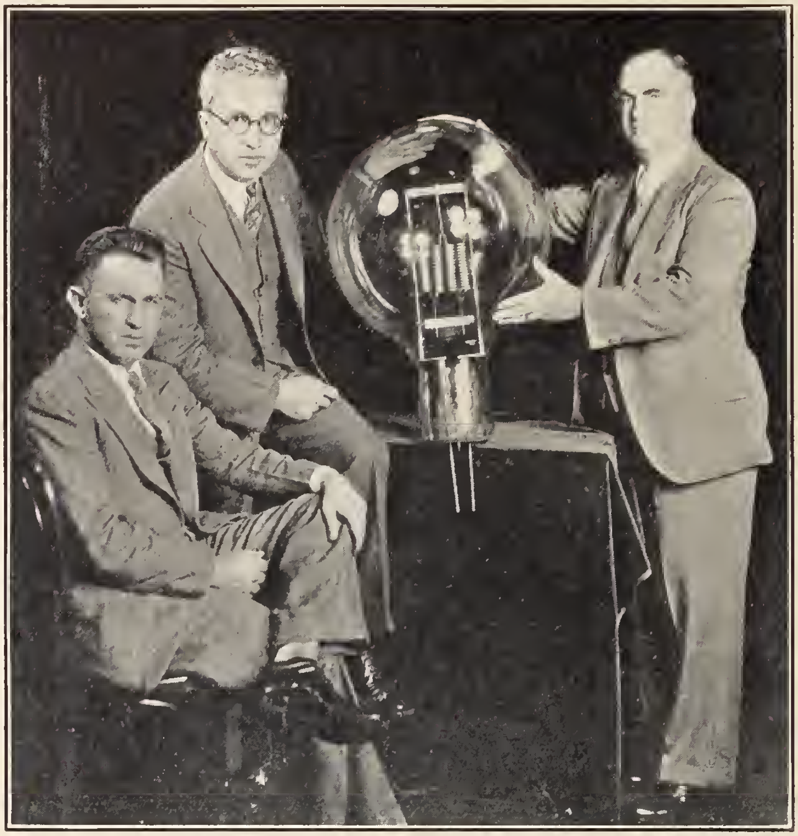
Some idea of its enormity may best be gained from the following figures:

This great super-mazda lamp has a current capacity of 50,000 watts. The tungsten filament was made from a special tungsten slug ⅝-inch square in cross section, 24 inches long. If this much tungsten was made into filaments for 25-watt lamps, it would have been sufficient to make 125,695 such lamps. This is the largest incandescent light bulb that has ever been made, and presented a number of very difficult problems in manufacturing. For instance, it is necessary to let into this lamp a current of 450 ampheres, and to give a proper seal to these lead-ins, it was necessary to develop an entirely new and ingenious construction.

The bulb is twenty inches in diameter, and was blown from hard glass, it being necessary that the wall have a uniform thickness throughout. In such a bulb were mounted in a projector, such as used in Motion Pictures, it would develop a beam candlepower of approximately three million.

While a lamp of such great power may not be of immediate use in Motion Pictures, the experience and knowledge gained from such a development will contribute much toward the perfection of design and the large types of lamps now in use. Just as the design of racing automobiles has contributed much of value to the design of your motor car, so the building of these Super-Mazda lamps is contributing much toward perfecting the lighting equipment so essential to the successful production of Motion Pictures.

The engineers of the Nela Park Development Laboratory were very much interested in getting the practical experience of the users of incandescent studio lighting from Messrs. Mole, Graves and James. These gentlemen are very optimistic as a result of the close attention which they found the lamp people are giving to the problems of the Hollywood Studios.



Peter Mole, of Mole-Richardson, Frank Graves and Fred E. James inspect world's largest Mazda lamp.

$2,500,000,000 Now Capitalization of Motion Picture Industry

THE important part that motion pictures play in the life and business of the nation was brought out by Will Hays recently when he made known in a speech in New York, before that city's Board of Trade, facts and figures that completely dwarf many other long-established industries and place the picture industry in the position of being one of the greatest enterprises of the country.

Presenting these facts, Mr. Hays declared that the picture industry is entitled to the support of "all business that has vision and idealism."

"Cynics and poseurs," declared Mr. Hays, "fling the phase 'business civilization' as an epithet. We accept it with pride, as an inspiration to keep our faces forward on the road we are climbing.

"Churches, schools, cultural opportunity of every kind, facilities for research whence science comes, scholarships for the ambitious, leisure for religious contemplation and for the pursuit of beauty—those are the gifts, increasing every day of American business to the world at large. The growth of the spirit is made possible by the mastery of the physical and material necessities and limitations, which have retarded the race in the past.

"We have, within the past years, increased the weekly aggregate motion picture audience in the United States by 10,000,000, meaning an increase each week of that many direct stimuli toward possession of comforts and conveniences available to the American family.

"As a business, we met the challenge of sound pictures with the necessary investment of $500,000,000 in two years. The total capital necessary in the industry has climbed to two and one-half billion dollars, distributed among nearly 100,000 stockholders and thousands of others who participate in theatre ownership.

"The industry employs 325,000 men and women. We use 150,000,000 feet of negative film in this country each year and 1,500,000,000 feet of positive film.

"Export of positive film during the first nine months of 1929 increased 41,000,000 feet over the corresponding period of 1928, and the Department of Commerce estimates that for every foot of American motion picture film which goes abroad, a dollar returns in stimulated trade.

"The motion picture's greatest aid to business is the furnishing of wholesome amusement and relaxation at a price the workingman can afford.

"We have wiped out confusion and hardship which formerly attended the life of the movie extra. We have developed a system of arbitration which in five yeaars has settled out of court 73,871 disputes involving more than $17,000,000. Within the

(Continued on Page 41)

On Christmas day 1949

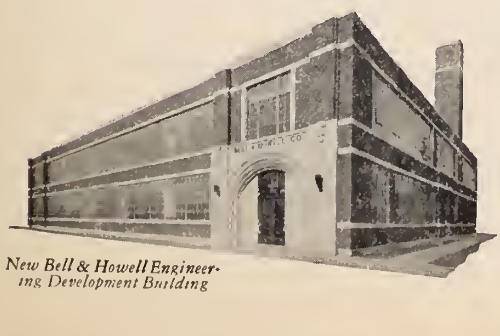
Twenty Christmases ago, the early products of a handful of film producers formed the main holiday treat of a very few thousand theater-goers. What kind of movies these patrons saw is now a kind of ancient history.

Christmas Day, 1949, will see a progress fully as striking as that represented in the movies which fifteen-odd million persons in 1929's Christmas audiences will enjoy.

In tomorrow's films, as they are in today's and were in yesterday's, the major technical advances are destined to bear the stamp of the Bell & Howell Engineering Development Laboratories. For they will be advances made possible of achievement by the tremendous technical resources accumulated by Bell & Howell during its 23 years of leadership in this industry.

You are invited to bring your technical problems on any phase of motion picture making and showing to

BELL & HOWELL



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Stage Technique in Talkies

(Continued from Page 3)

fore sound invaded the picture studios the cinematographers could do about what they pleased, and the sound men, in their laboratories and broadcast studios, had their own way likewise. With the merging of the two techniques plenty of difficulties arose, and in some studios the less enlightened men in each group began to get on the nerves of similar temperaments in the other group. There was no good in that for anybody, so the cinematographers, as the senior body, started a movement for better understanding and recognition of the ultimate mutuality of interests. Before long the public will pay to see and hear only those pictures in which the story is good to begin with and the photography and sound are good after that. Such technical discussions as the one cited above benefit the whole industry enormously by promoting the proper feeling among the men responsible for reproducing scene and sound.

Having considered these general aspects of moving picture sound recording at some length, we may proceed to a more technical description of the methods employed.

The studio itself is first treated internally to reduce the period of reverberation to a value suitable for dialogue recording. So much has been written on this subject, starting with the classical work of Prof. Wallace Clement Sabine down to the present extensive literature, that it is merely necessary to state here that for good speech recording the room should have a period of not over 0.5-0.75 second, and if the volume is too great to permit the period to be brought down to this value it becomes necessary to box in the set with absorbents, making a studio within a studio. The absorbents used must be effective at low frequencies as well as high, which generally involves thick layers (2-4 inches) of such materials as felt, mineral wool, and other compounds. In recording of music higher periods are allowable.

The next problem is to bring the microphones close to the actors, say between two and five feet. Within this range the best intelligibility is secured. Beyond it a loss of the high frequencies of speech, which are so essential to intelligibility, is inevitable. Furthermore, since these tones issue from the mouth in the form of a beam, like the radiation from a searchlight, the microphones should face the actors quite consistently throughout the action. This may entail placing a number of microphones, if the business of the play is such that it cannot be confined to a small area. And now complications arise because of the necessity of keeping the microphones out of sight of the camera.

Fig. 1, drawn to scale, shows a typical problem. The scene takes place in a drawing room, which is shown in side elevation, the background being the wall at the left. There is the inevitable fireplace, with the ancestral portrait above it, and two people talking in the direction shown. The camera is set for a long shot, about 40 feet from the back wall of the set, so that the focal plane is about 36 feet from the camera lens, the two actors being four feet out from the wall. The director wants the camera to take in the ancestral portrait on the back wall. In photographic section we have, then, an isosceles triangle, ABC, with a 20-foot vertical base, BC, and a 40-foot altitude, DA. The microphones must either be outside of this triangle, or, if they are to be placed within it, they must be masked from the camera. The usual location for the microphone in speech pick-up is above the heads of the characters, just out of the camera field, and in front of them. Referring again to Fig. 1, it is clear that a pick-up of this type is not feasible in this case. Measuring from the sound source E between the mouths of the two actors, the nearest point on the border of the photographic field is F, the intersection of the perpendicular dropped from E to the side BA of the triangle. This is about 10 feet, considerably too far for high quality speech pick-up. Furthermore, the microphones would be practically over the heads of the characters and out of the high frequency beam. If the microphones are moved forward along BA to a point in the line of the beam, about the best that can be done is point G, which is 18 feet from the speakers, a hopeless distance under most acoustic conditions for sustained dialogue. Hence in this case, barring a lateral pick-up, about the only recourse is the placing of a small table, a chair, or other piece of furniture at H on the stage floor, in which a microphone can be concealed about waist-high four to five feet from the heads of the actors. This method may run into other complications, of which more will be said later, but one does not have to be much of a geometrician to conclude from Fig. 1 that it is the only system offering any hope of natural reproduction at all in the situation shown.

The great advantage of the picture close-up in speech pick-up is shown in Fig. 2, which is drawn to a scale twice that of Fig 1. The camera has been moved to within 19 feet of the back wall, and the focal plane is now 15 feet from the lens. The camera height remains at six feet, as before, but it has been tilted forward at a five-degree angle. The optical triangle with which we must deal, ABC, includes an angle at the apex A which is not much less than in the long shot (20 degrees instead of 28), but, as the business of the scene proceeds much nearer the apex, everything is more favorable for sound. (The above photographic figures should not be taken too literally; they are intended only for illustrative purposes.) The camera field includes the heads and torsos of the actors, the upper line being some two feet over their heads (EF). A good pick-up position is available at G, out of range of the camera, fairly close to the direction of speech, and only four feet from the source. The only drawback is that G lies no more than 12 feet from the camera, and if the latter is not well silenced objectionable camera noise may be picked up. This is always a possible difficulty in close-ups, but the camera manufacturers have made notable progress in quieting their machines by judicious substitution of fibre gears engaging with metal ones, and similar measures. Of course in extreme cases the camera and its crew may be put in a sound-proof booth, but this practice interferes so much with effective photography that it is being discouraged in most of the studios. A well-silenced camera is usually safe to within ten feet of the microphone, when the speech level is not too low, and up to this point it may be trucked and manoeuvred to get cinematic effects which nobody who knows anything about picture-making wants to sacrifice.

Of course, just as in Fig. 2 the camera view slides past the microphones just below their location, it is sometimes possible to use the same expedient laterally. If the shot cuts to one side of the actors within a foot or two, a microphone may be placed outside of the camera field, but close to the speakers, who should favor it somewhat in working. Usually a transmitter in this position must be closer to the actors, for a given quality of pick-up, than one overhead, because it is not so easy to center it with reference to a number of persons in the scene.

In the usual picture practice the long shot of Fig. 1 and the close-up of Fig. 2 would be taken simultaneously, the cameras being appropriately placed out of each other's field. There may be three batteries of two cameras each, taking close-up, medium, and long shots, respectively, all on one take. This saves time, and gives a wide selection of shots for editing, but it has grave disadvantages from the sound viewpoint. Returning to Fig. 1, assume that the action contains some shouts, the intelligibility of which is not important, followed by sustained dialogue which should be clearly recorded. The director may take his long and close shots simultaneously, with the sound pick-up at G (Fig. 1) which will be satisfactory for the shouts but result in poor reproduction of the dialogue. If it is not feasible to use a prop-pick-up (I donate this term to the industry, with a graceful flourish, as a fitting name for a microphone concealed in a piece of stage property) it would be a better procedure, from the stand-point of sound, to take the long shot with the 18-foot pick-up for the shouts, and then move the pick-up to G in Fig. 2 before photographing close-up. Most of the directors have already learned that it is better to follow this procedure, even though it takes a little longer.

The skilled sound engineer utilizes a great many expedients, based on common sense and a knowledge of practical acoustics, in carrying on his job. Since the major defect of dialogue pick-up is loss of high frequency tones, he prefers to work with a slightly tubby loud speaker, simulating the decrease in high frequency amplitude which is common in theatre reproduction, and avoiding the psychological illusion of good intelligibility which a tinny loud speaker would produce. He avoids closed sets, especially with parallel walls, knowing that flutter echoes prevail in such enclosures and that resonances in them favor the low, boomy notes. At times he places heavy damping in back of the microphone, as in the German broadcast "tent" or in American broadcast practice, but at a distance of 10-18 inches, since putting the transmitter close to a cushion or other absorbent is likely, again, to result in loss of the upper frequency range. When possible he picks up with a single transmitter, but if the action requires it he distributes a plurality of microphones and follows the actors with the mixer. Between live sets and dead he will sometimes choose the one and sometimes the other—or, in other cases, take what the scenic director gives him. But he will object strenuously to curved surfaces whose radii intersect in the region of pick-up, because of the difficulties caused by regular reflection in this range. He avoids placing microphones on floors, and in walls, corners, or enclosures, because of the accentuation of low frequencies in such locations. Most microphones respond proportionately to sound pressure, and their size is such that at the

(Continued on Page 46)

Du Pont In Hollywood

ONE OF THE MOST *attractive business houses in Hollywood is the new home of Smith and Aller, DuPont film distributors. Above are shown a few scenes outside and inside their building on Santa Monica Boulevard. There visitors ever find a cordial welcome and an atmosphere of cordiality that is decidedly pleasing. The motion picture set shown in the lower left corner is a set installed for cinematographers to use for experimental purposes.*

Dog Star Dies

Pal, canine star, is dead here. He began his career ten years ago with a small part in a Wallace Reid picture, advancing to the stage of popularity by his continued appearance in comedies. The dog was 14 years old.

De Mille Asserts Talkers Will Improve Our Speech

That the talking films will improve speech in America is the opinion of Cecil B. deMille.

"We have been growing steadily more and more careless in our use of the English language until the talkies and the necessity for perfect articulation caught us up short. The talkies have the power to reclaim this situation. By virtue of their very mechanical limitations they are setting up the highest standards of speech we have had."

Recent Releases of A. S. C. Members

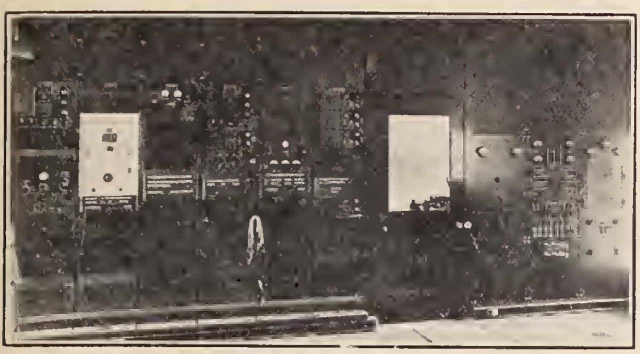
"The Mississippi Gambler"—Universal	Gilbert Warrenton
"Paris"—First National	Sol Polito
"Shanghai Lady"—Universal	Hal Mohr
"Song of Love"—Fox	Joseph Walker
"Seven Faces"—Fox	Joseph August

W. E. Acoustic Department Makes Rapid Progress

ACOUSTIC analyses of more than 500 theatres have been made in the last six months by the special acoustic department of Electrical Research Products under the direction of S. K. Wolf. Western Electric instituted this service to provide the industry with proper knowledge and information to achieve the mest results from sound wiring, and in every case where an acoustic analysis has been made it was possible to offer detailed recommendations for treatment to overcome any difficulties caused by theatre conditions, Wolf declares.

The department at present consists of a staff of 17 men under Wolf's direction.

No announcement was made at the time of its formation, the company wishing to say nothing until definite accomplishment had been made.



Electrical Test Shop E. R. P. I. Hollywood Laboratory

Electrical Research Products Opens New Engineering Laboratory on Coast

AN ENGINEERING laboratory for the West Coast has just been formally opened in Hollywood by the Electrical Research Products. The opening of the new laboratory at 7026 Santa Monica Boulevard is the culmination of plans that have been under way for almost a year, and a long felt need is at last filled, and immediate service is assured in the solving of pressing problems.

Ever since the completion of the first recording channels on the West Coast, Erpi engineers have had to contend with difficult problems brought about by the demands of producers. One of the outstanding was that of re-recording or dubbing and the development of suitable re-recording equipment and methods were carried on little by little in various studios during off hours when their equipment was not in use.

With the new laboratory it will be possible to test and pass upon changes and improvements suggested by studios more expeditiously, as well as to render a greater service to the New York departments in giving a more detailed and accurate picture of producers' problems as determined by company tests, rather than depending largely upon those made by studio engineers.

The installation embodies the latest improvements in equipment construction and includes a review room, a dark room, a convenient layout of room containing recording and electrical testing equipment and a machine shop, a small film vault, a sound proof room and an office.

The review room is equipped with a 2SX-41 system with all latest improvements. It has permanent seats for 38 people, but has sufficient size to accommodate about 75. Of special interest is the control table, which is equipped with a non-synchronous turntable, a fader, a volume indicator and a means for controlling ventilation. This room has already proved very useful, for holding technical meetings for Erpi engineers.

The electrical test room is perhaps the most important part of the laboratory and considerable thought was given to providing the proper equipment and facilities. It is, therefore, possible to set up almost any conceivable test in the minimum space of time. This room is also provided with a channel of recording equipment for recording on both disc and film. Associated with this room is a complete power equipment suited to the requirements of recording and testing, also the machine shop which is always a prime requisite in any well equipped laboratory.

Projection Room, E. R. P. I. Hollywood Laboratory

Sound Pictures

(Continued from Page 5)

coming from the artificial person on the screen.

Right here we run into several limitations. In the first place all people do not hear equally well, or perhaps we should say that a group of people will not hear the same thing in such a way as to get the same impression from it. They discount this in real life but it becomes confusing and perhaps unpleasant when the artificial becomes involved. In this case then we have immediately to find some compromise on the loudness of the sound which will most nearly fit all. This should definitely be a compromise and not an attempt to suit the most difficult case. If we reason that the average person with average hearing and reactions makes up the audience, it is to his conditions that things should be adjusted; in this connection the theatre management has the problem of finding this average and of continuing to feel it out.

Loudness of sound is a much misunderstood and misused term. All our lives we have been listening to things. If we do not hear them well we say they are not loud enough. If it is a speaker we get him to talk louder. With a sound reproducing system, however, we introduce a new factor. Increasing the volume of sound from the horn changes the actual characteristics of the reproduction, and if carried to the extreme, we can have the condition of sound so loud as to be painful but still unintelligible. The cause of this brings us to the much discussed question of the frequency components in speech and other sounds.

The original sound, whatever it may be, is made up of some definite combination of a number of frequencies in definite proportions. Let us assume that we can reproduce it faithfully at the proper volume. If now we increase this volume we find that the lower frequencies become much too loud and our sound becomes too bassy. Or, conversely, let us decrease the volume considerably below normal and it becomes thin—the lower tones have dropped out. This is easily tried with any record and illustrates the fact that for any reproduction we have a narrow range of volume inside of which we must stay to reproduce naturally.

Tied in with this matter is the question of the distribution of the sound, and with it the acoustics of the auditorium. Referring to the latter and its corrolary, reverberation, we find that reverberation, like medicine, when taken in the proper amount is a wonderful aid—but otherwise can become a tremendous disadvantage. Without reverberation it would be utterly impossible for a speaker to be heard in a large auditorium. With too much of it he is heard, but is unintelligible. In the latter case it does often work out, however, that under the same conditions music might not be unpleasant.

The acoustics of existing theatres used for sound pictures are as varied in their characteristics as the theatre designs themselves. As time goes on this condition will no doubt be improved. The reason for it is obvious, as existing designs had no need to take into account much more than seating capacity, viewing angle of the picture and the reasonably good rendition of musical accompaniment. With new requirements imposed the managements will gradually improve conditions, where necessary, with interior treatment of walls. In this connection it is of note in passing that the acoustics of a given room are much different when empty than when filled with an audience.

The other factor in distribution of sound is the arrangement of the horns. There are two schools in this respect, one placing horns back of the screen, and the other placing them around the sides of the screen. In the former case the horns are highly directional and are carefully pointed so that the combined effect of their several beams produces as nearly as possible an even distribution throughout most of the house. In the latter case the horns are much less directional, and in general there are more of them. Whatever the relative merits of the two methods may be, it is a fact that the actual distribution may in either case be far from uniform.

Reverting for a moment to the question of loudness and intelligibility we are confronted with the basic thought of articulation. By this is meant technically the ability to perceive and hear properly the sounds which make it possible to understand. Speech sounds may be broadly divided into two groups, more or less sharply defined—a comparatively low frequency group which provides the energy of the sound, and a much higher frequency group which provides the little niceties which result in articulation and intelligibility. Unfortunately, for our purpose, most of the energy producing group—and their energy is relatively great—are much the easiest to retain through all the processes of reproduction. Moreover, they are the ones which are most apt to be reinforced by reverberative effects. On the other hand, the articulation producing high frequencies are harder to record and much easier to lose, either in recording or reproducing. Our problem is them immediately outlined for us. We must be careful not to get more of the low frequency components in our recording than the original had, but we must strain every effort to keep and foster the high frequencies, perhaps even to the point of exaggerating them to a slight degree. This applies especially to dialogue, and to singing where an understanding of the words of the lyric is essential. Musical numbers can often afford to suffer more from loss of high frequencies, but in doing so usually creates the effect of being smothered or confused.

The next two factors are so tied in to each other that a joint consideration of them is proper. They are sound perspective and the monaural effect of all present sound reproduction systems. To take the latter first, the monaural effect is the name applied to the condition that a pick up microphone can represent but one of our ears. Human beings with their two ears and brain have the faculty of sorting out the sounds which they want to hear and of automatically sensing the small time difference between sounds striking first one ear and then the other. It is this faculty which enables us to hear voices above a crowd, to sense the direction from which a sound is coming, to visualize the size of a sound source—in short, to do all of the myriad things which we constantly do and can do with no other sense than our hearing. As compared with this we have in recording but a single channel through which our reproduction can come, and ultimately we hear it from a single set of horns. There is at present no way of simulating the effect of our two ears other than to use two channels throughout and to listen on a specially connected headset. By this means a good imitation of normal hearing may be obtained, but obviously this is not for theatre uses. We must then so plan in recording and reproduction as to create for the audience an illusion of normal hearing. The single picture is a good parallel. Lacking stereoscopic photography we trick our available photographic processes to produce an approach to a stereoscopic effect. As we provide an artificial brain for the camera, just so must we provide the brains for the microphone.

Manifestly, if we can maintain, and even to some extent exaggerate, the perspective of our sound we can help to get this two-eared illusion. Perspective in sound exists just as truly as picture perspective. Without going into a detailed discussion of it, the difference which we perceive in sounds from, say, various distances, is not as it might seem at first thought, merely a change in the relative volumes. There is a definite change in the composition of the sounds. As the source moves away from us the sound loses its high frequency components as we hear it. Hence, one reason for the greater ease in understanding a person close to one's ear.

Following the same thought the perspective changes with the type of action. If we are to have the illusion of being in an audience watching a stage play, we have one type of perspective. Here the characters are talking to one another, but are definitely doing it in such a way that the audience can hear. If, on the other hand, we have the vaudevillle skit, the actor is performing to us in the audience, and may be made much more intimate and apparently louder because of the nature of his act. Contrasted with this is the more nearly motion picture type of thing where the audience might almost be eavesdropping on the action taking place on the screen. In this case we would expect to hear quiet dialogue, almost as though we were in the room but unknown to the performing occupants.

From another standpoint, dialogue from a speaker in the foreground must clearly come from his lips and from no where else. If he moves to the back of a deep set, the source of sound, while in general at his lips, still becomes a little more confused because of the natural reverberation in his surroundings. If, however, we think of music—an orchestra—we more properly feel the orchestra to be in its right place if the sound appears to emanate from all around the screen or even to some extent from an imaginary room in back of the screen. Preservation of the proper sound perspective is probably one of the greatest factors in the successful production of the required illusion.

Thus far we have assumed that we may reproduce the entire range of volume present in the original. This assumption would seem to be imperative if we are to create the illusion of real life on the screen. Unfortunately this range of volume is not available and will probably not be for some time to come. In the first place, as we know from theoretical studies and from our individual experience, sounds are not always heard only—they are often felt—particularly when loud. We do not hear an explosion near us half so much as we feel it—it shakes us all over. With the apparatus available to us this condition cannot even be simulated, as the total range of sounds we hear, and otherwise sense, covers a tremendous volume range.

As compared with this the normal volume range available to us in recording is but a fraction of this total. The recording volume range has as its upper limit the amount we can get on the record without overloading it, and as its lower limit the ground or surface noise in the record. We must stay between these limits.

This range can be considerably extended by accurate and expert manipulation of the theatre fader, and as time goes on we can hope that the technique of providing such control in the theatres will be studied and full use made of it. At present the most that can be expected is to have attention paid to a few very simple fader cues, and even they are often missed so completely as to cause serious detriment to the effect desired. Automatic fader control is feasible, and has been worked out experimentally. Adaption of some form of such control would be a marvelous aid to the consistent production of the effects we desire. In isolated cases a fader control has been placed in the audience where the operator can feel the audience's reaction and keep the volume at the right point. This has been very successful where done. It has the disadvantage of requiring an extra operator, a disadvantage which is more than offset by the fact that with such control a picture may be consistently put on right—without it, consistent performance is nearly impossible.

This brings us to the important and difficult problem of the adjustment and manipulation of the sound apparatus in the theatre. The nature of this apparatus is such that extremely fine and careful adjustments must be made—and constantly maintained—in order to secure proper results. Theoretically this should be quite simple. Actually it is well nigh impossible. Whether the record be released on disc or film, the projection problem which confronts the producer is almost overwhelming. This is said without anything in mind which might be derogatory to theatre management, or operator, or apparatus supplier. It is simply the result of the rapid growth of this business. The studios are doing whatever they can to learn the problems of the exhibitor, and the exhibitor is doing his share of learning as well. The equipment used is of many kinds and of many degrees of perfection, the care and use which it gets are as varied as can be expected from the standpoint of the human element. Many are groping for an understanding of what is to be expected from the sound product itself. We have all had many times the unpleasant experience of hearing a picture in a theatre where the sound was very bad, when the same picture in our own review rooms was very good. Or perhaps of hearing the same picture twice in the same theatre —once it would be fine, the next time unbearably bad. How seldom have we heard a really excellent performance of a product which we know to be good.

There are two practical answers to this problem, and to the other phases of the recording and reproduction problem. The first is the creation of a better understanding between producer and exhibitor of their sound problem. The other is the constant attempt on the part of the studio to so guide its work that the product is not only made as nearly "fool proof" as possible, but that it also have in it enough of the intelligent exaggeration and artificial naturalness that it may be played under poor conditions and still sound fair. This art of intelligent exaggeration is gradually evolving among the various studios, and if done with a clear knowledge of what the product will be up against in the field will be of tremendous value in enhancing the usefulness and success of the sound picture.

Screen Star's Voice Captivates Paris

Hope Hampton, by Opera Triumph in Paris, Becomes One of Talkies Finest Prospects.

NOW AND then one meets a woman who combines undescribable beauty with unusual versatility. Such a woman is Hope Hampton who appears on the cover of this magazine this issue.

To describe the beauty and charm of Miss Hampton is something beyond the ability of mere man. It takes an artist with his gorgeous colors to do this adequately, for only colors can describe the magnificent and fiery red hair and the coloring of this actress. Miss Hampton has been seen in many beautiful pictures in natural colors, and those who have seen them never stop talking about the way she fits into color photography.

However, Miss Hampton's claim to fame is based on more than her beauty and ability before the camera. She has scored signal triumphs on the stage in light opera and musical comedy and now has done what no other screen actress has done—has scored an outstanding and signal triumph in opera.

It has been years since an American girl has carried Paris in quite the way Miss Hampton did when she made her debut at the Opera-Comique. As "Mimi" in Puccini's "La Boheme," and as "Manon" in Massenet's opera Miss Hampton stamped herself as a great artist and won the universal acclaim of the severest critics of France. Twelve times was this American screen actress recalled after the final curtain had dropped on her performance of "Manon". Her acting and beautiful soprano voice had her audience enthused to a point almost of delirium.

Some idea of the way she triumphed may best be gained from a few of the critics' reviews, extracts of which follow:

"Her success was immediate and striking. The instant she appeared, the crowded hall gave her an ovation, so impressive was the feeling that here was the ideal Massenet heroine. The beauty, brilliancy and charm of Miss Hampton assured her the triumph which her ravishing voice confirmed throughout the evening."—*Journal des Debats.*

"She interpreted the role deliciously, and seemed, by her personal charms, her grace and coquetry, the very personage of a work in which is reflected the genius of the French lyrical theater."—*Le Matin (Jean Prudhomme).*

"A delightful Manon and her debut at the Opera-Comique was crowned by brilliant success. Delicious singer, expert actress possessing the highest degree the rare qualities of sincerity and emotion served by an extraordinarily racy temperament. Her voice is of the most agreeable quality, clear as crystal, musical, sonorous, brilliant in the upper register, sweet in the medium.

"She acted the death scene in the last of 'La Boheme' with touching intensity. She was truly admirable."—*Le Figaro (Andre Nede).*

"Miss Hope Hampton is delightfully pretty and young. Clever actress, sensitive and witty, she is also an accomplished singer. Her ravishing pure voice flows fresh and facile like the waters of a spring."—*Paris-Midi (Pierre Lazareff).*

"It would be impossible to imagine a more exquisite appearance than that of Hope Hampton. She possesses the following essential qualities, so rarely united: sincerity, technic, art and feeling. An admirably placed voice, supple, well disciplined, fine allure and extraordinarily racy."—*Excelsior.*

"*Hope Hampton gets new praise in role of Mimi.* Besides her singing, Miss Hampton's acting was charming, as can be expected of an artist who already has won renown on the screen.

"*Hope Hampton scores a hit in 'Manon' role. Charms audience.* What a beautiful Manon! What sumptuous costumes. A critic is disarmed before this array of feminine charm. From the moment she emitted the high notes,—which were clear and of a remarkable good timbre—in the scene in the Cours-la-Reine, her success was assured."—*New York Herald (Louis Schneider).*

"Plastically, Miss Hampton was the dreamed-of Manon, very beautiful, graceful, harmonious in her gestures and most beautiful costumed. From the vocal point of view, her interpretation was excellent: the young artist manages her naturally agreeable voice with ease and finish."—*Le Petit Bleu (Andre de Montgon).*

"A beautiful American artist. Miss Hope Hampton in Manon received the consecration and homage of Paris. She triumphed over all difficulties and when the final curtain fell, she was recalled twelve times. Miss Hampton was not only a pleasure for the eyes: her clear voice, with its pnre and nuanced high register, was marvelous, especially in the St. Sulpice scene, so difficult for foreign artists to interpret."

"What is first of all so remarkable in Miss Hampton, is the address and sureness with which she presented such dissimilar personages of Manon and Mimi. Hers is a voice of penetrating charm, good metal in the high notes, exquisitely sweet in the medium."—*Comoedia (Jean Messager).*

"She obtained a success rare for Paris. Twelve recalls after the final curtain and mountains of flowers. Such a scene is not often witnessed, even in Paris. It would be difficult to imagine a Manon more gracious, prettier, more charming, more evocative of the epoch than Miss Hampton's."—*La Revue Russe; La Theatre et la Vie (Armand Dore).*

"*Great hit in role of Mimi.* Rapturous applause. If the young American soprano is not delighted with the reception given her she must be either ungrateful or terribly hard to please. Such demonstrations as the favorite numbers aroused are not often paralleled in Paris theatres. One lost count of the recalls at the end of the acts, in particular after the third, when enthusiasm became delirium. If all the clamour for encores had been complied with, we should have heard 'Boheme' almost twice in the one evening. Miss Hampton fits the role admirably. She is the Mimi."—*Daily Mail.*

"For the delineation of the character, she has the advantages of a seductive figure, native elegance and a vivacity of acting that lends itself to all the expressive nuances the part requires. When one unites as does Miss Hampton, intelligence and will to such splendid gifts as hers, there is no limit to the perfection it is possible to attain."—*L'Intransigeant.*

"Miss Hope Hampton units delicacy of expression in singing, in person and in gesture, the stage rendering these even more appreciable than the screen."—*L'Ere Nouvelle (Louis Laloy).*

"The personal attractions of the singer, her gorgeous costumes and the quality of her impersonation apparently told, for she was recalled and cheered as heartily as could be desired."—*The Boulevardier (Irving Schwerke).*

"As an actress, her gifts are incontestable. Her voice is fresh and like a brilliant thread."—*La Liberete (Robert Dezarnaux).*

"She won a great success in spite of the difficulty of singing in a foreign language. Her personal beauty, her youth, her graceful attitudes certainly stood her in good stead, but she would have been applauded for her voice alone,—a well timbered soprano, agreeable and light and which she manages with ease up to the highest notes."—*France-Auto (J. de Montgon).*

"There were unforgettable moments, for which Miss Hampton should be thanked. The public gave her an ovation at the end of each act."—*La Volonte (Gilbert Mauroy).*

"Extremely pretty, marvellously costumed, Miss Hope Hampton played her part with exquisite charm. As a singer, she was warmly applauded. Her voice is beautiful, wide in range, well timbered, and she conducts it adroitly. The success of the beautiful American singer was conclusive."—*L'Echo de Paris (Paul Gordaux).*

"She conquered the minute she appeared, thanks to the charm of her exquisite beauty, heightened by the sumptuosity of her costumes."—*L'Ami du Peuple (Andre Himonet).*

"The voice of this singer is supple and brilliant in the npper register, and she sings high D sharp without the slightest difficulty. Her costumes are extremely sumptuous."—*Le Courrier Musical et Theatral (Louis Charles Battaille).*

"The voice, ample and agile, is ravishing in quality; its musicalness is expressive. This young singer is a great artist."—*Ambassades et Consulats.*

With color and sound now the thing in pictures, it is the opinion of this writer that the producer who is fortunate enough to secure Miss Hampton for a picture in color and with songs will realize ere long that producers with foresight and good judgment must watch opera as well as the stage and screen for talking picture artists, for in Miss Hampton one finds an unusual subject for both color and song.— H. H.

RALPH STEINER, *former Dartmouth student, who won first prize in the 1929 Photoplay amateur contest for his non-dramatic film H^2O, is pictured above. Steiner showed, by his selection of plain water as his subject, a rare photographic mind that gives promise of greater things in the Cinematographic future.*

Multicolor

(Continued from Page 9)

greatest step of all is the fact that Multicolor has achieved the hitherto impossible feat of making slow-motion pictures in full color! Since the introduction of the new *Rainbow Negative* numerous tests have been made under varying light conditions and with camera speeds as high as eight times normal, with perfect success. The results, in fact, were definitely better than the average of ultra-speed monochrome, but with perfect color added. By virtue of its simplicity, Multicolor offers the whole Industry the boon of perfected, workable color, for not only may it be used by the greatest producing companies, but by individual industrial firms as well. There is a surprisingly great field for color in modern industrial filming, though not enough to justify the vast cost of special cameras and apparatus whose use would be limited solely to color work. In this field, Multicolor, requiring only a special magazine and film, is supreme, for once the film gate is adjusted to Multicolor work, any Bell & Howell or Mitchell is at once a color and a monochrome camera, for either process may be used without further change.

The personnel of Multicolor is as well known as is the process. Executive control is vested in William J. Worthington and Rowland V. Lee, neither of whom need further introduction to anyone connected with the films. It is a tribute at once to their sagacity and to their faith in the industry which has given them so much, that they have shunned the speculations of so many film folk, and reinvested their money in what they owe so much to—motion pictures.

The technical development of multicolor is the result of more than five years' intensive effort on the part of William T. Crespinel, who has frequently found time to contribute to these columns, and who is internationally famed as an outstanding cinematic scientist. His achievements with Multicolor have been made in the face of repeated discouragement from "expert" sources; assurances that each impending step was attempting the impossible. What he has attempted may have been impossible once, but today nearly a dozen companies are using the perfected results of his labors in their current production.

"The only limitations now affecting Multicolor," says Mr. Crespinel, "are those of our own laboratory capacity. We are increasing that just as fast as is humanly possible; right now we are turning out more than 20,000 feet daily, but with every standard camera in the business a potential Multicolor camera, we'll have to make further increases yet, so we are building a plant capable of processing 1,000,000 feet a week. Aside from that, Multicolor has no limitations, for we can work under normal production conditions, and give the producer his daily rushes in both sound and color at the same speed he is now getting them in monochrome.

"Any of the present sound systems may be used with Multicolor, the sound track being colored by either one of the basic colors used in coloring the film. Furthermore, we predict that Multicolor will be perfectly suited to all the systems of wide film when they arrive, for our patented film-gate construction holds the films absolutely flat in the camera, and our double-coated prints being a single film, have no tendency to buckle in the projector. On the other extreme, we are devoting considerable time to research in connection with adapting Multicolor to the requirements of 16 mm. practice, for we feel its simplicity makes it the logical color process for the amateur."

Cinematography for the Multicolor firm has for some time been in the capable hands of William Williams, who has lately been joined by Ross Fisher, A. S. C. They, together with Mr. Crespinel, have been engaged in solidifying the actual practice of Multicolor cinematography to a point at which it is literally on a par with monochrome work from the practical cameraman's viewpoint. Williams finds the greatest feature of the process is that same simplicity.

"Like most of the other cameramen," he remarked, "I never used to think much of color work. When they brought color crews onto my sets they were just in the way, with their special cameras and their need for five or ten times the normal amount of light. But since I've been working with Multicolor, it's been different! I've found a process that will do anything that is possible with black-and-white and with the same equipment throughout. It's been a job convincing some of the boys of that, though, I can tell you!

"The other day I got one of those skeptics in a corner, and made him look at some of the stuff. That almost convinced him, but he wanted a real, personal test. So the next day I took one of our cameras out onto his set at the studio, let him set up the lighting

(Continued on Page 36)

A.S.C. Members' Skill Again Demonstrated

Facts and Figures of Interest In Shooting Great Sea Picture

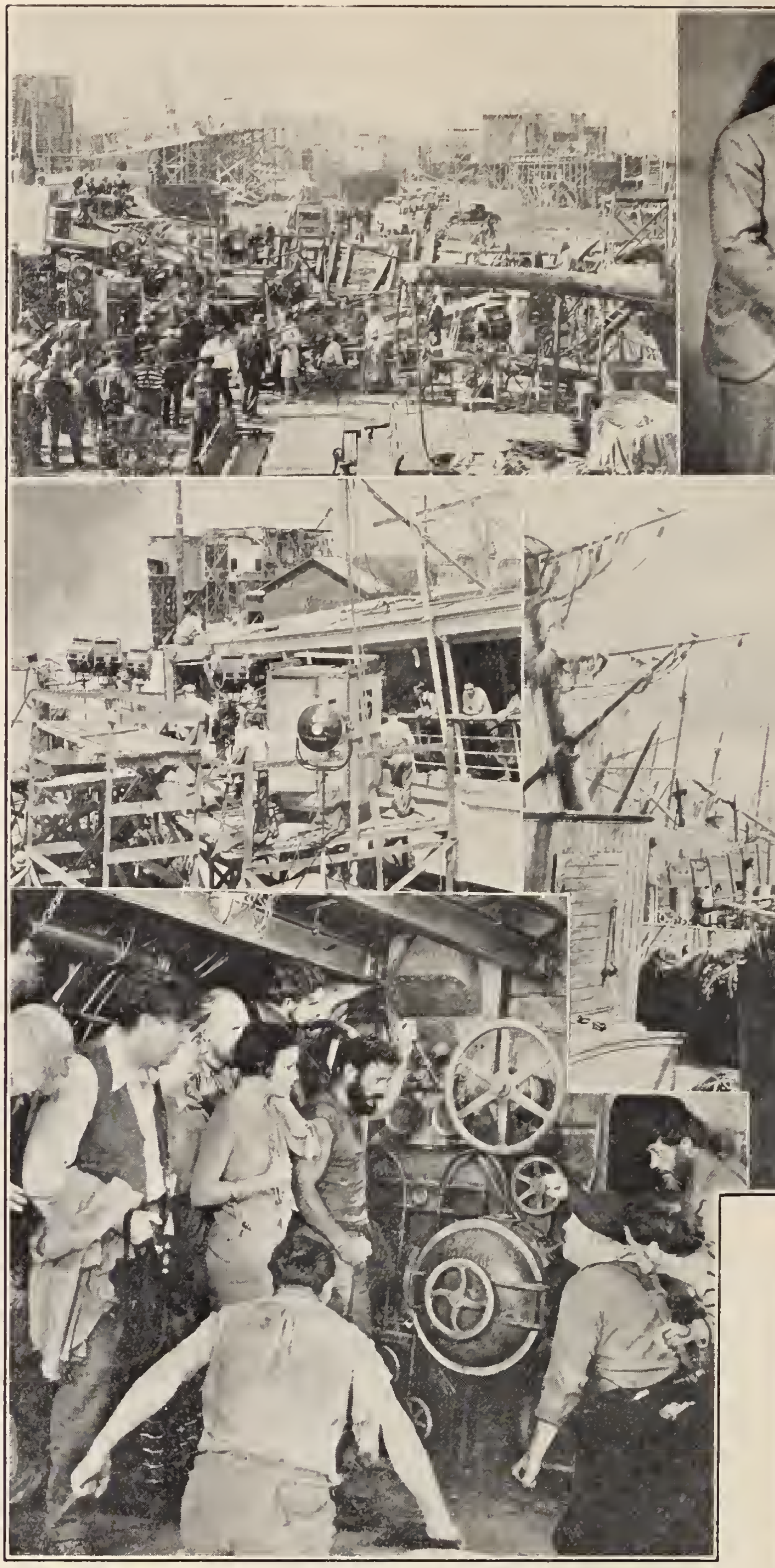
By Hal Hall

AS THIS writer has said many times, no group of men in the picture industry receives so little exploitation as do the cinematographers. Again and again we see spectacular pictures depicting striking and almost unbelievable scenes laid in distant lands. And if it were not for the skill of our cameramen and the cleverness of the cinematographers in the field of trick photography many of these scenes would never be shown—for the cost would be prohibitive if they had to be staged in reality. In addition, some scenes could not be made except by the skill of the trick cinematographers.

Take, for example, the first National picture, *The Isle of Lost Ships*. Here we have a magnificent example of the cinematographer's art at its best. On the screen you see a vast area of the Sargasso Sea literally covered with the wreckage of thousands of slime-covered ships. It is a magnificent spectacle; one that makes you fairly gasp at its enormity; makes you wonder where such a scene could have been staged.

Well, it was staged and photographed on three acres of dry ground on the First National Studio lot at Burbank, California, and on a miniature stage in the studio. On ground so dry and dusty, under normal conditions, that to merely walk across it would raise enough dust to almost hide an individual. And it was the magic of Fred Jackman, A. S. C., head of the miniature and trick department, plus the cleverness of Sol Polito, A. S. C., chief cinematographer of the picture, that placed this on the screen in a manner that makes one feel that it must have been photographed on a vast sea. Except for some actual wreckage, seaweed, shallow water and glass shots, the remainder of the great "Sea" with a forest of spars and rigging reaching clear out beyond the horizon was pure cinematographic magic. Camera magic by cameramen who rarely receive a word of mention when such spectacles reach the screen. Magic by men who year in and year out give an art to the screen that alone is the reason for America's supremacy in the picture field.

Getting down to facts and figures regarding the Sargasso Sea in *The Isle of Lost Ships*, the following information should be of interest:



Cameramen Bring Sargasso Sea to Hollywood Studio

ABOVE ARE SCENES at First National's Studios during the shooting of "The Isle of Lost Ships." Three acres of dry ground and a trick stage became the Sargasso

Three acres of the Sargasso Sea was on the big back lot. Several hundred square miles of it was built on the studio's "Trick Stage," Number 5.

The area was compressed into a camera-width triangle 120 feet long on one side, 100 feet long on the other, and 160 feet at its greatest depth or distance from the lens.

Sea while this picture was being made. In center, top, are Director Irvin Willat and Chief Cinematographer Sol Polito, A. S. C. Bottom, center, is Fred Jackman, A. S. C., who had charge of the miniature and trick work.

The ships were miniatures, and false perspective was achieved to a certain extent, giving an even greater impression of distance. Behind the first twenty to thirty feet of real miniature wreckage, which varied in size and complexity from floating, mossy spars and wooden kegs to large ships, was merely a frame holding the masts, spars and rigging of vessels supposed to be behind.

Camera Magic Turns Lot Into Sea

Water, on which the miniatures actually floated, was, of course, used in the foreground. Mosses and lichens, and other growth of the sort represented the seaweed, which the trick department had studied and photographed.

Barnacles and other accretions such as dried salt were seen in the foreground miniatures, reproduced in painfully exact proportion.

One of the greatest problems of proportion was that of the rigging. Twine and cord for the foreground sheets was used, but for the diminishing perspective this went down to small threads, which, of course, were also used for the slighter ropes.

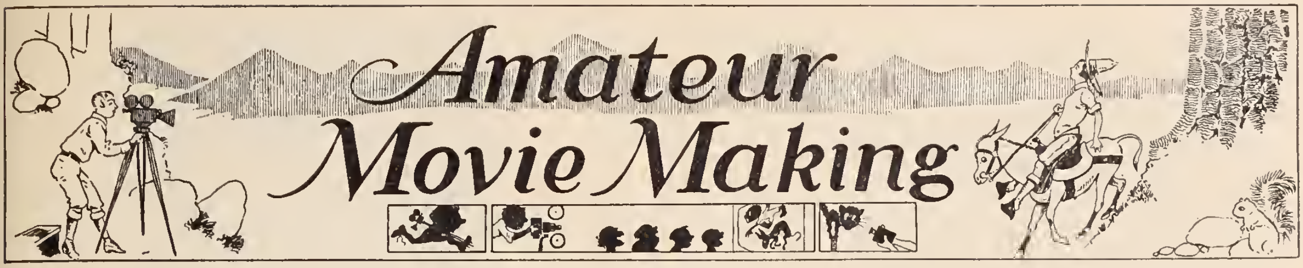
The wrecking of "The Queen," and her struggle in the storm up to the time she smashed the derelict and was crippled, as well as the small boat action was done in miniature. The submarine, interiors, exteriors and submergence, was done full-size.

The deck, cabins and lower spars of "The Queen" from the forward deck aft to the stern were built full-size on the studio lot, and this dry-land, three-quarters of an ocean liner was arranged on double rockers so that it would tilt in two directions; motion on board was achieved by Gimble tripods.

The clouds for the miniature scenes were duped in, except in a few shots where they were created for storm effects by smoke of a heavy, slow-rising variety released to float slowly up and sideways under a sky hood of blue cloth, carefully lighted.

So, there you have the story of the cameramen's skill in cinematographic trickery. The photographs in the layout here shown give an idea of results obtained, as well as give you an inside look at the actual workings. Truly a remarkable piece of work, stamping these men as masters of a great art—cinematography.

And—some picture executives are advocating that the names of the cinematographers be omitted from the credit titles on the screen. In fact one company has so ordered. From the point of view of a bystander who admires art, this writer believes that to omit the cinematographer's name from screen credit is about like leaving out the name of Columbus in the history of the world.



By WILLIAM STULL, A. S. C.

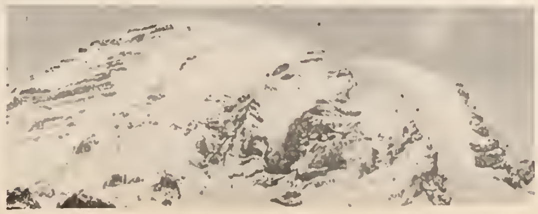
That First Snowfall

WRITING this in the midst of Southern California's famous sunshine, it is difficult indeed to realize that much of the rest of the world is draping itself in a mantle of snow. Yet such is the case, for the wires are daily bringing fresh reports of the various "first" blizzards of the season. These early storms offer the enterprising cameraist some of the most spectacular possibilities for pictorial cinematography that ever come his way. None of Nature's miracles is greater than the witchery by which she transforms even the most prosaic objects into silver-clad forms of beauty after every snowfall. In the cities, the changes are inspiring, while in the parks, and, best of all, in the country, her magic attains its fullest sweep. The soft, white blanket she spreads over field and fence and tree makes even ordinary scenes beautiful ones, and lovely ones, divine.

In this most beautiful of her moods, Nature offers every cameraist, no matter what his special bent, a glorious new field for his endeavors. To the pure pictorialist she offers the manifold beauties of snow-blanketed landscapes and the ice-coated wonders of winter seascapes. To the photographic follower of *Art Moderne*, she offers the strange new designs with which she overlays the familiar objects of life—streets, buildings, lamp-posts, even the lowly icicles. To the matter-of-fact realist, she offers a series of thrilling, everyday dramas. Surely no battles were ever half so hardly-fought and dearly won as the constant battles our great cities fight to keep their transport moving, to keep the vital pulse of men and food flowing on schedule, and to maintain communication with the world at large. What more thrilling subjects could such people find for their cameras than the battles fought by the tram lines, the railroads, and the city's fire fighters against the gripe of winter? But Nature does not forget that great majority of cameraists to whom such cinematic artistry *per se*, though vastly desirable, seems an unwarrantable expense. To them she offers the pleasure of photographing the whole endless range of winter sports. Children playing in the snow, small boys staging thrilling snowball battles, or building snow-men (who, by the way, are interesting stop-motion subjects), these only begin the list. The vast range of adult winter-sports are great subjects. People skiing, skijoring, tobogganing, and skating have endless possibilities, or mention only a few. Aside from the thrills latent in all of them, most of them have equally great comedy potentialities: the humour that can be extracted from plump Aunt Emma's first efforts on the ice, or lanky Cousin Horace's lack of grace on skiis can rival the efforts of many a professional comedian. And, Oh! the fun of seeing Uncle George, the Imposing, in difficulties with a pair of snowshoes!

To Filter or Not to Filter?

It must be admitted, however, that from a technical standpoint, Winter's photographic conditions are far from ideal. The intensely brilliant light reflected from the snow is unexpectedly strong in the blue and ultra-violet rays, and unless carefully watched, will play the very old scratch with our pictures. If we don't use a filter, there's likely to be no end of halation, and, if there are figures, a distressing soot-and-whitewash sort of a picture. It is really quite a problem, though, choosing a filter, for on the one hand we have the brilliantly white snow, rich in the powerful actinic rays, demanding a short exposure, while on the other hand, we have the extremely dark figures of the actors, demanding a long exposure. Therefore, unless we are to have a most unpleasant, contrasty film, we must in some way compensate for this disparity. The answer, of course, is a filter. But what sort of a filter? Not too light a one, for that would be no help. Not too dark a one, for it would increase the exposure necessary for the dark parts of the scene, and thus defeat its own purpose, by increasing the very contrast it should have lessened. A 2x filter will usually be found about right: say a Wratten K1½. After correcting the exposure for the filter, to be on the safe side, increase it just a trifle, and the contrast should be just about right. If you own a graduated filter, it can often be used to excellent advantage in this sort of work, using the middle, lighter, portion, with the clear part revolved so that it is over the part of the scene which least needs filtering.



Of course Panchromatic film is the best for making these winter scenes, for it alone gets the full benefit of the filters. Also, exposure meter, like Dr. Meyer's *Cinephot*, is of more than ordinary importance. Incidentally, while on the subject of light, the beauty of natural back-lightings just after a thick fall of soft snow, or a sleet storm, is worth photographing. Also, in winter close-ups, reflectors are surprisingly necessary, for without them even the most perfect complexions are likely to photograph even darker than the beach tans that were the style last summer. And though our modern maidens enjoy tanning themselves into regular Indians in June, they are strangely quick to rise in the wrath of injured virtue if a luckless photographer under-exposes their faces in December close-ups!

The last precaution in winter cinematography is informing the laboratory technicians that the roll they are handling contains snow scenes. If they know that, they will develop it accordingly, so that the best possible results are given—if you have taken proper care of the exposure. Of course, there is one drawback: if the roll is so plainly marked that the laboratory men can't make any mistake, some people are going to find their pet alibi swept away!

Christmas and Cameras

Christmas, according to all indications, is on the way here. It brings the cine amateur a number of things to think of. For one thing, a camera can do a lot toward lightening the problem of personal Christmas cards. So much has been written about the making of Christmas cards by still photography, that little can be added on that score, but perhaps the thought that a movie camera can be used the same way may not have spread so widely. Of course, considering the present cost of film, one can hardly suggest sending out reels of 16 mm. Christmas greetings—but individual frames are another matter! If one has one of the various enlarging devices which attach to the projectors, it is easy to find individual frames of sufficient artistic merit to be enlarged to form the backgrounds for photographic Christmas cards, while if the card is to carry the sender's face, a strip of movie film is just the thing to get it from, for surely among the hundreds of frames in each scene there can be found one which represents the desired face at its best, care-free, unposed, and natural. Besides, if one wants a really novel card, why not leave a small hole in it, and stretch a few frames of actual film over it, showing, say, the sender's face, in lieu of a signature? Even if these various methods do not please, the mere idea of carrying a movie motif through an ordinary card sets it apart as one to be remembered for its originality.

Snapping Santa

Christmas also brings a number of opportunities for special, personal filming. Of course the first thought that leaps to most minds is the personal record-film. However, the nature of most Christmas celebrations makes this somewhat difficult, though still distinctly possible. If such a record be undertaken, however, there are a few points which should always be observed. The first thing is to have a good general idea of what is to be shot, well in advance of the time of filming. Brief notes may suffice, but a reasonably complete continuity is best. Don't be misled by the time-honored delusion that by working haphazard you will capture spontaneity. You won't. Of course there will always be a certain amount of spur-of-the-moment inspiration once you have gotten used to the mechanics of filming, but as a rule it is worth while to remember that amateur films are in at least this one respect like professional ones: the most spontaneous-appearing touches are usually the result of deliberate planning. It takes very highly trained actors and directors to actually be spontaneous on the set. In real life, the most spontaneous touches are those which occur when there is no sense of the restraint which comes from an audience or a camera. Therefore, in making these record films, where it is possible to shoot people unaware, do so. It pays.

In making deliberately planned record films, never be afraid to use close-ups. In general, show your geography in a long-shot, and your action in close medium-shots and close-ups. Furthermore, remember that for effective close-ups, the more even lighting of light shade is to be preferred to dirct sunlight, except in rare cases. Also, if in making these scenes, any sort of interior-lighting equipment is available, use it, for indoor scenes are the heart of a Christmas picture. An ideal light for your Christmas picture is found in Westphalen's lamps which are designed especially for home use. Take scenes around the tree, of the children in the first joy over their new toys, and at the table. But, when shooting around the tree, remember that it and its decorations are highly inflammable, and act accordingly. Firemen are understood to enjoy their Christmas turkey as much as the rest of us, and to strongly resent having to leave it to put out Christmas-trees.

Another field is the movie *for* Christmas. If there are children in the home, a little playlet, specially staged, showing Santa emerging from the chimney and arranging the presents, perhaps to be met by father, and then suddenly vanishing, is a sure joy-bringer. Incidentally, the joy that multiple-exposure fiends can get out of making such a film, putting the old saint on the house-top, working the necessary disappearance, etc., in the more elaborate examples of such films, probably eclipses that of the children watching the results.

In any case, whether the picture be made *for* or *on* the holiday, the maker should remember this fundamental rule of amateur filming: *never show your audience anything but the complete, edited, titled version of the film.* To do anything else not only reduces their enjoyment, but is likely to injure your own reputation as a cinematic craftsman.

And—the Presents

Since Christmas presents are an essential part of our thought of Christmas—a necessary evil or an enjoyable feature, depending on our viewpoint and the vagaries of the stock-market—why not make this a cinematographic Christmas? Most of us have at least a few friends to whom we are in love or duty bound to make gifts, who are cine amateurs. No matter how little—or how much—you may feel it proper to spend for such presents, there is surely some cinematic accessory which will just fill the bill, and, being a *cinematic* gift, will be appreciated beyond all measure. Most of the manufacturers, and many of the dealers, have issued catalogues which contain a wealth of gift suggestions. If you have cinematic friends, a glance at these catalogues will help to solve the gift problem, for you are sure to find something appropriate, whether it be a color filter or a super de-Luxe Talkie outfit. Incidentally, a few of these catalogues left "carelessly" in the right place, aided, perhaps, by discreet hinting, may bear very excellent fruit. Of course, we all agree that it is better to give than to receive—but it is just possible that other people, too, are having trouble in making the right choice, and need—helpful suggestions!

New Cut-Off Device

Canterbury, N. S. W.—New automatic cut-off slide, said to permit change-over from one projector to another without any interruption, has been patented in America and Australia by William McKenzie, former proprietor of the Canterbury here. The device can be used on all makes of machines, it is claimed.

British Talkie Activity

London—More than 250 installations of its talking picture equipment have been made by British Talking Pictures in houses throughout Great Britain, according to this company's announcement.

HERFORD TYNES COWLING, A. S. C.

IT IS with real pleasure that the editor of this magazine makes the announcement that Herford Tynes Cowling, head of the Eastman Teaching Films, Eastman Kodak Company, Rochester, N. Y., has been added to our board of editors.

Cowling, long one of the best known members of the American Society of Cinematographers, needs but scant introduction, for his name is known the world over. Born in Virginia, he chose photography as a hobby while only a boy. The hobby became a profession, and in 1911 we find him introducing motion picture photography into the United States government service. In 1913 Cowling became chief cinematographer of the U. S. Reclamation Service. In 1915 he photgraphed "See America First".

He left the government service in 1917 and went abroad for Burton Holmes. That trip covered the South Seas, New Zealand, Australia, Philippines, China, Japan, Formosa, Dutch East Indies, Siam, Federated Malay States, Straits Settlements.

In 1919 Cowling photographed the entire theatre of war in France, Belgium, Italy, Austria, Czecho-Slovakia, also Southern France, Algeria, Tunisia, Tangier, Sicily, Spain, Egypt, Palestine, Constantinople. He has hunted wild game in all parts of the world with both gun and camera and has written extensively on his travels, including a trip into the forbidden Thibet.

His pen will soon become active again for this magazine and our readers are promised some rare treats.

Talkies Increase Exports

INCREASE of about 25 per cent in film exports for the first nine months of 1929 as compared with the same period in 1928 is shown in a preliminary statement by the M. P. Division of the Dept. of Commerce. Total exports to all markets during this period in 1929 amounted to 201,137,429 linear feet with a declared value of $5,449,491, against 159,832,636 linear feet valued at $4,675,647 for the corresponding nine months last year.

Exports of positives accounted mainly for the large increase. Europe continues to be the leading market, and with the advent of sound films this has become the largest quantity market. This position was formerly held by Latin America, which shows a slight decrease in film imports for the nine months.

The United Kingdom becomes the leading individual market, followed by Germany and France. Australia, for the first time since 1925, fails to head the list of important individual markets, but it shows an increase of about 12 per cent in imports for the first nine months of 1929.

The Far East, Canada and British South Africa also show increases over last year.

Imports of sensitized but not exposed films for the period amount to 273,139,357, an increase of more than 50 per cent. Negative motion pictures imported for the same period totalled 1,926,749, a slight decrease. A decrease also is shown in imports of positives.

INFORMATION FOR AMATEURS

Amateurs—Send your problems to this department and we will solve them

Q. To what extent does the elevation of a camera effect the horizon distance?—F. T. D., Dayton, Ohio.

A. Obviously, a man on level ground can only see a few miles, but at 3000 feet one can survey a 58-mile circle, and at 6000 feet one of more than 165 miles. The Army's figures: for relative visibility are: 10 feet, visibility 6,800 yards; 100 feet, visibility 21,500 yards; 300 feet, 37,300 yards; 500 feet, visibility varies between 48,200 yards and 52,100 yards. If the object viewed is 25 feet high, these figures are increased to respectively, 17,500 yards, 32,200 yards, 48,000 yards, 59,900 yards, and a maximum (due to refraction) of possibly 63,700 yards, or over 30 miles. For a 50-foot object the figures jump to 22,000 yards; 36,700 yards; 52,500 yards, 63,400 yards, and a maximum of 68,600 yards.

Q. What materials are used for the snow and ice in winter scenes of professional movies made in such places as Hollywood? —J. E. B., Rainbow, Conn.

A. Salt and crushed marble-dust are often used for snow, while of late rolled oats and special bleached cornflakes have furnished the raw material for movie blizzards. Real ice can often be made in studio freezing plants, but solidified hypo is more popular, especially where skating scenes are being done, for the hypo-ice can be readily smoothed over by the application of a hot iron.

Q. What exposures should I give with the special red-sensitive film known as Panchromatic K?—R. H. B., Chicago.

A. Using such red filters as the Wratten No. 25, No. 70, or the regular "A" tricolor filter, in average light and normal camera-speed the stop should be f:2.5, though with special hyper-sensitized stock F:3.5 can be used. The hyper-sensitivity lasts about a month.

Q. How can I determine whether a lens is negative or positive?—R. B. K., Boston.

A. Perhaps the simplest test is to hold the lens at arms' length and rotate it in a plane at right angles to the line of view. If the image seen through it seems to go *opposite* to the hand's motion, the lens is convex, or positive. If it does not move, there is no lens action. If it goes *with* the motion the lens is negative. Also, a negative lens will not throw an image on a screen as a positive one does.

Q. What is the difference between direct and indirect titles? G. H. D., Seattle.

A. Direct titles are made from white cards with black lettering, photographed with ordinary (*not* reversal) film. The result is a film with white letters on a black field, which can be spliced in with the rest of the film and run as usual. The Indirect title is made by photographing a black card with white lettering using either reversal film, or normal stock from which prints are to be made, giving an exact reproduction of the tone values of the card instead of a reversed one, as in the case of the direct title. The direct method is the logical one where only a single copy is required and where speed is important. Where many copies are required, of course the indirect method must be used. In either case, positive film is used for photographing the title, by virtue of its superior contrast.

Q. Should filters be used only with panchromatic stock, or will they also benefit othocromatic film?—E. M. H., Boise.

A. The more common yellow filters are to a certain extent helpful with ortho stock, but they only reach their full effectiveness with Pan. As for the red and orange filters, they should absolutely be used only with Pan stock.

Exposure Problems

A Unique Method of Estimating Exposure When Caught Without a Meter

By H. Syril Dusenbery

IN ORDER to have an intelligent understanding on the subject of exposure it is first necessary to know just how the sensitive film emulsion records the image. We are all familiar with the fact that this image is directly dependant on the light that reaches the film, not only the amount of light, but the quality as well. When sufficient light reaches the film so that the image formed when it is finally developed is a clear and faithful representation of the original subject, it is said to be correctly exposed. Movie makers will find that with a little practise and experience this goal of correct exposure is not difficult to attain.

The only light that reaches the surface of the film when a picture is made is the light that is reflected from the subject itself. It should be remembered that regardless of the general brilliancy of the light, it is only that portion of it which is reflected by the subject that is effective. Naturally dark subjects do not reflect as much as white ones. For this reason dark objects require more exposure. Also a subject in the direct path of the light will reflect more into the camera than a similar subject receiving the light at right angles to it. The color of the light reflected must also be considered since the ordinary emulsion is much more sensitive to blue colors than to red. While the many factors that enter into the matter seem to make it quite complicated, in actual practise it is surprising how quickly the eye can be trained to judge the proper exposure necessary to obtain good screen results.

It is strongly recommended that the movie maker use an exposure meter until he has trained himself to judge light conditions accurately. Select any type meter that appeals to you and stick to it. Do not change meters continually. The Cinophot and Dremophot meters are particularly recommended as they actually measure the light reflected from the subject. These meters give very accurate results even in the hands of a novice. By doing a little systematic testing, you can quickly learn the shortcomings and errors in the readings of your meter. The matter of personal equation enters to a considerable extent with many types of meters as no two people see things exactly the same way. It is, therefore, suggested that your meter be tested and checked against actual screen results.

To test any meter, take an average scene, a street for example, and determine the exposure (lens setting) with it under the given light condition. Jot this down for future reference. Now shoot a few feet of film with this recommended exposure. This done, change the lens setting to the next larger opening and shoot again. Then change the lens setting once more, this time making it the next stop smaller than that originally indicated by the meter, and again shoot a few feet of film. Make notes of exactly what you have done. When the finished film is projected on the screen you can quickly decided which of the three shots appears the best and, by referring to your notes, you can then compare the lens setting that produced the best results with the setting recommended by the meter originally. It may be that you are in the habit of reading your meter too high or too low. This simple test will show you at once. It should be repeated under different light conditions and with a variety of different subjects. Both the film and your notes should be preserved for future reference. While all film possesses considerable latitude, a little careful testing in this way will quickly demonstrate that there is a very definite lens setting that gives the best results.

The old rule, "when in doubt over-expose," does not apply to film finished by the reversal process. Over-exposed film appears almost like transparant celluloid and the pictures are weak and devoid of detail. Under-exposed film, on the other hand, is dark and dense when finished. As the under-exposed film is the lesser of the two evils, the revised rule becomes, "when in doubt UNDER-EXPOSE." Incidently, the use of a smaller lens opening will make the picture sharper and more distinct on the screen. It is, therefore, recommended that the smallest lens opening, consistent with the prevailing light conditions, be used at all times. In this discussion we are assuming that the shutter speed is constant and that the exposure is controlled exclusively by changing the size of the lens opening or stop.

All things being equal a long shot requires *less* exposure than distant objects and the use of a slightly smaller lens opening is a close up. More light enters the camera when photographing distant objects and the use of a slightly smaller lens opening is suggested. On the other hand, do not fail to open up the lens at least one stop number when shooting a close up immediately following a long shot. It is to be remembered that when shooting close ups, especially with the larger lens openings, it is essential to have the lens correctly focused. To insure accuracy, the distance from the camera to the subject should be carefully measured with a tape line. Professionals always do this and you should do likewise if you want your close ups to be needle sharp on the screen.

Late in the afternoon, especially in Fall and Winter, the sunlight becomes very rich in red rays. This light is very deceptive as it appears quite bright to the eye but is rather inactive photographically. Often the change in color of the light is so gradual that it passes unnoticed, but the sensitive film is not fooled and the result is the pictures are dark and under-exposed.

Many methods have been devised to aid in the estimating of correct exposure. Most of these methods are rather cumbersome and complicated. While it is recognized that the many factors that enter in the determination of correct exposure make it almost impossible to devise any "rule of thumb" method to fit all cases, the following original system, worked out by the present writer and published here for the first time, will, under ordinary normal conditions, give a remarkably close approximation. The simplicity of this new system makes it easy to memorize. It is based on the use of 16 mm. reversible film. Normal shutter speed and average summer light conditions in northern latitudes are assumed. In this system the light conditions and subjects are each divided into four general groups. Memorize them! You then have the entire system at your finger-tips.

The Dusenbery System

Light Conditions	*Subject Classifications*
1—*Very Dull.* Overcast sky with heavy black clouds.	1—*Heavy shade.* Subjects under trees, on porches, etc.
2—*Dull.* Generally cloudy with no direct sun light.	2—*Streets* and buildings. Subjects partly in the shade.
3—*Bright.* Sun shining thru thin clouds or light haze.	3—*Open Landscapes,* White Buildings, sports and scenes without shade.
4—*Brilliant.* Strong clear sun light. No clouds or haze.	4—*Sea, Sky, Snow* and Beach subjects reflecting strong light.

To estimate exposure under this system using the above classifications, simply multiply the number of the light condition by the number of the subject class. The result is the lens setting in the "F" system! In the event that there is no lens marking that corresponds to the result thus obtained, it will be satisfactory if the next nearest lens marking is used. For example, the exposure for an average street scene in brilliant light is obtained by multiplying 2 by 4. The result 8 indicates that stop F.8 should be used. In the case of an open landscape with dull light, multiply 3 by 2. The result is of course 6. The nearest standard lens marking to 6 is F.5.6. While this system must be used intelligently, the accuracy of the results are almost uncanny. All who have given this system of rapid estimation of exposure a trial have enthused over it and it is hoped that this method will help the movie maker to solve his exposure problems. It is not intended that this take the place of an exposure meter. It merely serves as a guide to those desiring to estimate exposure quickly when no meter is available.

No mention has been made in this discussion as to the use of color filters. Every filter is marked with a definite factor by its manufacturer. This factor is usually given for both ordinary film and panchromatic film. The deeper the tint of the filter, the more the exposure. Full directions usually accompany every

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Of Interest to Amateurs

Reflectors

A REFLECTOR is especially helpful, in fact almost indispensible for good results, during the fall and winter months when the light is not as bright as in the summer.

Filter

THE color filter made for use with the f.4.5 long-focus lens for telephoto effects will, according to the Eastman Company, greatly improve the quality of movies taken with this lens.

Cine-Kodak

ADVANCED amateurs who prefer the hand-cranked Model A Cine-Kodak, are informed by the Eastman Company that the present Model A, f.1.9, Series K, Cine-Kodak can be used for Kodacolor with Kodacolor film and Kodacolor assembly. Older Model A, f.1.9 Cine-Kodaks must be sent to Rochester before they can be used for Kodacolor work.

What To Give for Christmas

ANOTHER Christmas is approaching and that annual problem of what to give is with us. In the case of home movie makers, why not give movie equipment? Nothing could give them more pleasure. And then, there is James, or Fred, or Bill, who have been wanting a camera. Why not give it this Christmas? A partial list of equipment from which to select is suggested here:

Cameras, color filters, exposure meters, remote control device, portrait attachment, books on photography, a year's subscription to the AMERICAN CINEMATOGRAPHER, camera cases, lens modifier, Cinophot, Dremophot, focusing microscope, tripod, tripod heads, projectors, projection lenses, projection screens, range finder, editing devices, film storage cases, camera cases, Kodacolor filters, Leitz distance meters, correctoscope, speed lenzes, lenses of all kinds, Sunny Twin arc lamps for home movie making, make-up, film, still cameras, a Recordion home talkie equipment complete, new 16mm. releases.

Chicago Cinema Club Elects New Officers

THE Chicago Cinema Club opened its winter season recently with a well-attended meeting, and elected the following officers for the coming year: President, Dr. O. B. Nugent; vice-president, Joseph G. Davis; treasurer, U. S. Smith; secretary, Dwight R. Furness; directors, Howard Webster and Joe Simons.

New Kodacolor Lens for B. & H. Filmo 75

BELL & HOWELL announces a special lens, known as the 4 A T-H.C. 1 in. F1.8 for the Filmo 75 camera. This lens is designed particularly for Kodacolor work. It is smaller than the special Filmo 70 lens for Kodacolor, yet it is claimed to give the same degree of perfection for natural color photography. While it is designed particularly for color use it is said to be an excellent lens for black and white work as well.

Great Lite Projection Lens

FILMO projector owners who desire greater brilliancy in their projected pictures may now, according to Bell & Howell announcement, secure 25% more light. This is made possible by the new Great Lite Projection Lens which is now on the market for the Filmo projectors.

At present this lens is available only in a 2 in. focal length, but other focal lengths are to be offered later.

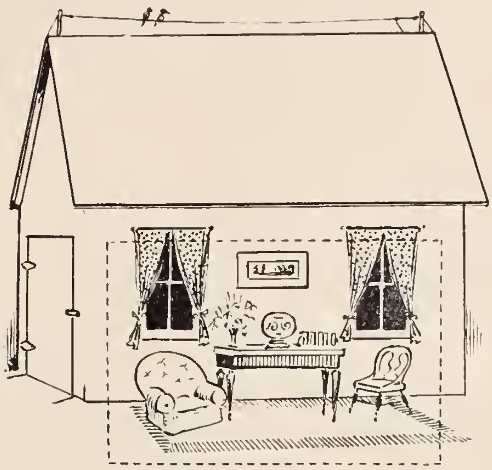
SETS FOR HOME MOVIES

The Exterior of Your Garage Becomes An Interior If You Know How

By HAL HALL

THE very important matter of "sets" is, perhaps, one of the most difficult problems that faces the home movie maker when he gets down to the serious business of shooting an amateur production. In the first place, the amateur has to hurdle that tremendous obstacle known generally as "mental hazard."

After viewing a particularly gorgeous array of sets, such as, for example, those in "Broadway," the ordinary home movie maker quite naturally feels a bit dazed when he steps out to create sets for the little picture which he and his wife are planning to produce. However, he need have no fears if he first of all decides, wisely, to leave the elaborateness to professional movies, and then uses the factors that are literally at his back door. By this I mean that an ordinary stucco garage offers amazing possibilities in the construction of sets for home use.



Making a room out of a garage wall

Suppose, for example, you wish to create a simple but cozy living room. If you have a window in your garage it will assist admirably. First, you decide on how much space you want to show in your living room. Then you mark that on the exterior wall of the garage. The stucco garage wall will be an excellent wall for the living room. A set of attractive and bright cretonne curtains are then hung on the outside of the garage window—if there are two windows it makes the set still better—and you have gone a long way toward making your living room.

Next take a living room rug and place it on the ground, if there is a cement driveway it will be better, and you are ready for the furniture. An attractive table placed against the wall, a couple of pictures hung properly, an attractive lamp on the table, some chairs, and there you have a living room set that will serve adequately and well for your purpose.

The cost has been nothing, unless you have to buy the curtains, for the rug, chairs, lamp and pictures can all be borrowed from your own home.

You are then ready for your actors and shooting. All you must remember is that you must be careful that the only portion of the garage to appear is that selected as the outside lines of your space desired. Also watch the front line so you won't take in part of the driveway or the garden. The illusion on the screen will be just as effective as though you had gone to extreme expense in building a set after the manner of a motion picture studio.

There are two decided advantages in a set of this kind. One is that you have privacy, for it is in your own back yard. The other is that you can allow it to stand, and it will be in no one's way and need not be disturbed as it would have to be if you used your own living room. Then, too, if you wish to do your "shooting" in the daytime you, by the use of simple reflectors, can have all the light you need. But if you shoot at night you are in the privacy of your own property and have more room to place your lamps.

Naturally, if the sides of your garage are of clap-boards, you cannot use the garage as the wall of a living room, but such a garage will be easy to find among your friends. And, if your house is stucco you can use it instead of a garage. If you require more than one room for your picture you can use the side of the garage for one room and the end of the garage for another. If you need a third room, a simple switch of the furnishings will transform the living room into a bedroom or dining room.

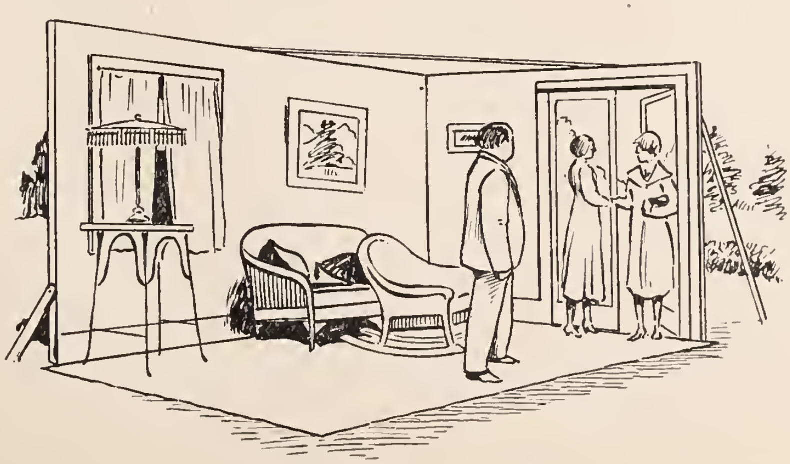
If you wish to do something a little more elaborate in the matter of sets you may do so at a very trifling cost and the results will be astounding, providing you have a vacant lot on which to place up your sets. There will, of course, be more of a thrill, perhaps, for all concerned because you will be more nearly approaching the manner of the studios.

All you need is carpenterial ability, a few tools and some very cheap compo-board, and light canvas or heavy muslin. And here is how it is done.

You wish to build a living room set. First, remember that you only need two side walls. So, you decide on the dimensions, and then decide how many windows or doors you will want to show in your picture. Draw a rough sketch for your plan and go ahead. Build the wall for one side, with its windows or door, using the light compo-board. Then cover it with canvas or heavy muslin. Then build the other wall and cover it. Be sure they are well braced. Then out in the vacant lot erect the two, being careful to join the corners well.

A paint brush and paint will soon transform the canvas-covered walls into whatever color you desire. On the "floor" it will be well, unless the ground is very level and smooth, to place compo-board. Then put up your curtains, lay your rugs and place your furniture, and you have a set that can be photographed from as many angles as you can desire.

The advantage of a set such as this is that you can photograph from the inside showing action through the windows or doors outside; and if you have a beautiful garden just outside the door or windows you can do much in the way of pictorial beauty for your picture.



Here's what you can do with compo-board

If you plan your set construction carefully you will be able to do much with very little set expense. For example, make your walls in, say, three sections, or "flats." Your window on one wall will be in one of these sections. If you wish to show another room, you just take out this section and replace it with another, re-arrange your furniture or change it completely and you have another room at the cost and trouble of only one new section. One important detail to remember is that you must be sure to brace the

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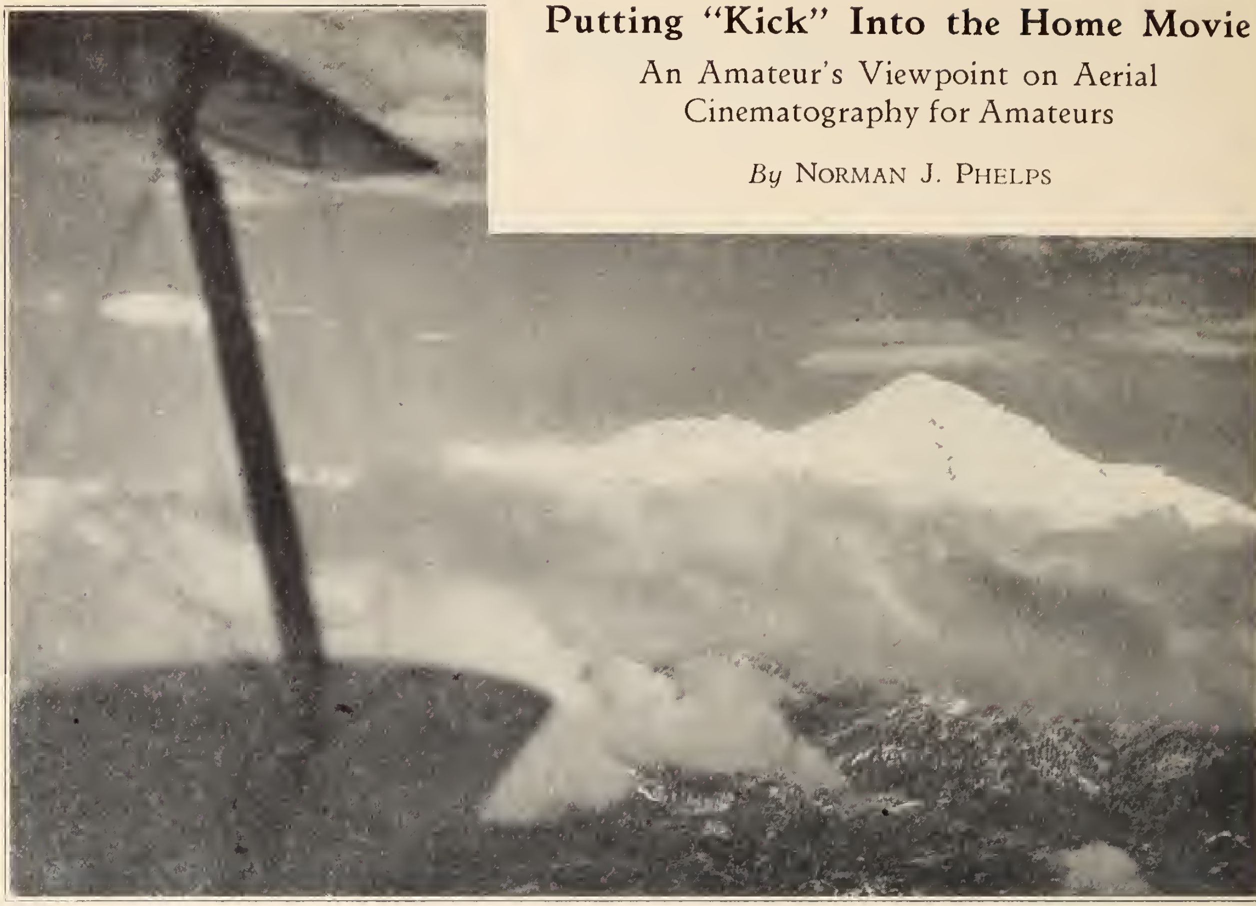
Putting "Kick" Into the Home Movie

An Amateur's Viewpoint on Aerial Cinematography for Amateurs

By NORMAN J. PHELPS



Hold your camera in such a way that you show a section of the wing as well as sky and ground.

DOESN'T he look natural?" That's the inevitable comment the instant a beautifully back lighted close-up of Uncle Jack flashes onto the screen. It's a compliment to you, of course. But it's also a remark quite frequently passed at events when an audience is gathered for reasons other than entertainment. There's no question but that the family album will mean a great deal to you in future years, but if amateur movies are to provide entertainment, we must produce pictures that furnish our audience as much "kick" as we get out of the actual photography.

Contrast the quiet smiles that greet the showing of Aunt Norah shelling peas on the back porch to the exclamations that are certain to burst forth when you take your audience up for a sojourn among the clouds. If your aerial picture is made right, you'll have your spectators falling out of their chairs the first time they go into a vertical bank—and if you have planned your picture with the following in mind, some one is certain to yell for the smelling salts before the first twenty-five feet have run off.

I don't purport to be an authority on entertainment. Neither am I posing as an expert aerial cinematographer. I'm just an amateur who loves his hobby. But I do know it's easier to provide real entertainment by photographing an *unusual thing*, than by trying to film a *usual thing* in an *unusual way*—and it's a safe bet that nine out of ten members of your friendship list can be made attentive, appreciative, and air-sick all at once if a little care is used in filming a $5, fifteen minute sky cruise over the home village.

When you go out to make your thriller, bear one thing constantly in mind: there's no thrill whatever in mere bird's eye views of the water tank or the public library. Aerial photographs of the whole town, post-card style, are on sale at all the drug stores, three for a nickle. The thing that's going to make your picture a success, is how accurately you bring the actual feeling of flight to the screen—and to your audience.

Select an open cockpit biplane and, if possible, a pilot who either has made aerial pictures before, or one who will listen to your story and fly you the way you'll want to be flown—the object of the game being, to fly in a way that the position of the plane can be constantly shown in varying relationship to the horizon and an interesting portion of ground. Unless this is done, your picture will lack feeling and there just won't be any thrill to it.

We'll assume that you're seated up in the forward cockpit all alone. It's best that you don't take another passenger with you. He'll only be in the way, and if it's his first flight he won't enjoy the kind of flying you are going to have to do. Your first shot will be the take-off. Point the camera directly toward the ground at the wheels—if you can see them. When you get on your way, tail-up, push the button and hold it until well after the wheels have bid good-bye to mamma earth and the ground diminishes rapidly as you see it through the view finder. This should take about twenty or twenty-five feet 16 mm. and should be made at normal speed. I tried it half speed but there was too much blur.

Now that we're really up in the air, you must let your audience know it. A most effective way of doing this is to begin with a nice, gentle, straight shot of the ground from about 2,000 feet. Point the muzzle overboard and straight down. When you run off three or four feet, panoram the camera up toward the nose of the plane and hold it for an instant in such manner that you have a section of the lower wing, a part of the fuselage, some ground, and about one fourth sky in the frame. At this point, your pilot has to go to work. Signal him to throw the ship into a steep vertical bank. If you hold the camera exactly as suggested, some one in the audience is sure to holler "Help!" Your picture should have at least three vertical banks in it, and a generous side slip if your own stomach will stand it.

A nice dive will help too. Point the camera right out over the ship's nose and start the music. When the dive comes, the horizon will jump up from the bottom of the frame and the effect will be all that is desired. Have it arranged with friend pilot that the dive be followed with a close spiral. If you keep the camera trained through the ship's "prop," your audience will feel just as you did. During the course of the downward spiral, you may easily produce a few more gasps if you have a six-inch lens, by suddenly cutting in a six-inch shot of your rapid progress toward the roof of the town's tallest building.

Now, if you have another hundred feet of film, five or ten more dollars to spend, and if your pilot is sure that the Department of Commerce Inspector is in Washington where he belongs, and if the clouds are real white and pretty, you might try a tight spin from above the clouds, all the while filming the ground through the numberless ragged holes in the afore-mentioned. The ground, clouds and all will, of course, twist around in merry old style on the screen. Show this shot to the unexpected guest before dinner, if the butcher forgot to send the extra lamb chop.

The long and short of putting "kick" into aerial pictures is to keep such a relationship between camera, ship, horizon and ground, that the actual movements of the plane are accurately recorded.

I have also found, at the expense of considerable film, that there are a number of things about the mechanics of aerial photography that don't occur to the average amateur who has never done aerial work. To begin with, aerial pictures that are to show ground detail should be made at double speed, 32 a second or if you're real low, 64 a second. Not because of the plane's forward movement, so much, but because of air bumpiness. Double speed with a two or four-inch lens from 1,000 to 2,000 feet gives splendid results. Use your one-inch lens and normal speed only when shooting banks, dives, etc., when the movements of the ship are more important than ground detail. For double speed I hold the ultra-speed button on my Victor about half way down, and of course the Victor has the regular 64 a second speed. I like the Victor for aerial work for several reasons other than the numerous speeds it affords. The Victor finder is a sure-shot proposition when quick lens changes are made, and the Victor motor runs 33 feet of film at one winding.

Now there's the matter of exposure, which, in turn leads to the subject of the best kind of film to use. When in the air, I have never yet been able to hit exposure just right for reversible film. 180 degree light is confusing to me, and there's not much comfort in looking through a Cinephot when your feet are pointed at the sky. So I suggest negative film. You can be four times wrong with negative and still get good pictures, and when you're paying five dollars per each fifteen minutes of flying, the extra cost of the negative-positive print process doesn't mean much. Use "pan" negative. It's best, you'll find, for clouds and for ground detail. A K2 and a K3 filter with the consequent alterations in exposure will help too.

Try a couple of hundred feet of aerial movies in line with the above suggestions. I think you'll be immensely pleased.

Hal Roach Comedies in Foreign Tongues

THE foreign motion picture markets are not to be without their quota of laugh films, according to an announcement from Hal Roach. This energetic producer of two reel comedies is the first in his field to begin foreign language production. He has already taken steps to bring out Spanish editions of Laurel and Hardy, Charley Chase, Harry Langdon and Our Gang comedies. German and other language editions will follow later.

Two new comedies now in production, a Laurel and Hardy and an Our Gang, have language experts on the set teaching the fun makers how to say their comic lines in Spanish. A scene is first enacted with the dialogue recorded in English, then immediately repeated with the words spoken in Spanish.

The selection of the language tutor was not an easy job for the Hal Roach officials. The problem was to find a teacher who had both a sense of humor and a knowledge of the language of the streets in the foreign tongue, since elegant Spanish would hardly fit the personalities of two reel comedians.

Hal Roach believes he has been successful in his search for the right person to fill this important position. Strange as it may sound, Robert O'Connor is the man who is teaching Stan Laurel, Oliver Hardy and Our Gang to say funny words in Spanish. O'Connor is the son of an Irish father and a Spanish mother. O'Connor's paternal heritage guarantees the humor, his mother's gift is a comprehensive knowledge of the Spanish language, and his own experience as a comedian at the Hal Roach Studio for the past four years, has provided him with a pretty good idea of what comedians say while engaged in funny business.

Showmanship Essential Quality for Good Projectionist

DECLARING that above all showmanship, inborn or acquired, is one of the most necessary qualities for a good projectionist, William F. Canavan, International President of The International Alliance of Theatrical Stage Employees and Moving Picture Operators, brought out the great part the projectionist plays in the picture world at a luncheon tendered him in New York last month.

Excerpts from Canavan's speech follow:

To those of us who have a personal interest in this particular subject, there is great satisfaction when we visualize the tremendous strides that have recently been made in the development of projection room practices and equipment. These recent developments have been of signal importance to the millions of patrons of the justly popular motion picture entertainment, and have given a new impetus to one of America's greatest industries.

With the coming of these vast changes in projection room practices and equipment, the members of the projectionists local unions throughout the United States and Canada are fully alive to the great responsibilities that will devolve upon them and are preparing themselves by intensive training and study, to meet the changed and changing conditions in projection problems, come what may. The projectionist is more of an idealist than a working man. He looks upon motion picture projection as a specialized art and is ever striving to improve the quality of screen entertainment even though it entails a personal sacrifice. The consciousness that the success or failure of the entire screen performance is dependent upon his skill and its application in the handling of the delicate projection equipment, has a natural tendency to keenly arouse him to sense the great responsibility of his profession. He approaches his task, not from the standpoint of a worker who is to receive a monetory consideration in the form of wages for a given number of hours of service, but rather from the standpoint of an artist, mechanically etching upon the silver screen a series of beautiful photographic images that are unfolding to his movie audience a visual impression of a beautiful story told with the aid of his mechanical pen.

The introduction of sound presented a series of problems that were entirely new to the projection field. To begin with, the sound equipment had only been subjected to superficial laboratory tests prior to its installation in the theater. These tests had been conducted under uniform and ideal conditions, by technicians who had developed a pace with the sound equipment. But theaters could not be re-constructed so as to make them ideal for the new sound installations. The physical conditions obtaining in many of the theaters were such that it was next to impossible to achieve the desired results.

After the installation was made, the responsibility of operating and maintaining the sound equipment became the duty of the projectionist who had little or no knowledge of the complicated device, aside from a few hours of operating instruction. This unfamiliarity was not due to his indifference. There had been no opportunity to secure the technical information necessary or to prepare himself for this new responsibility. From the outset it was apparent there would be trouble. Many changes had to be made, before the sound equipment measured up to the exacting exhibition requirements of the modern motion picture theater. The projectionists who pioneered the introduction of sound have every night to feel a great satisfaction in the contribution they have made in the development of this epochal achievement. I feel one may safely say that the problems arising through the introduction of sound were far and away the most difficult with which projection room staffs had ever been confronted.

The men who have solved the problems in a practical and highly satisfactory manner are to be congratulated. They are deserving of the highest commendation from the entire industry for this splendid service.

It is a pleasure to note that the better class of theaters have at last come to a realization of the importance of the projection room and are furnishing adequate and modern projectors and equipment, which enables the projectionist to produce proper screen results. It is to be regretted that many theatres are still using inadequate and antiquated equipment. Good projection requires good projectors. Poor screen results will do more to injure a theater's reputation and patronage than any other single factor. Bad projection and good business are never companions. Show me a theater where proper projection standards are not maintained, and I shall show you a theater where business is in the same category as its projection.

I want to caution all of you who are projectionists against ever being satisfied with projection mediocrity. There is always room for improvement, no matter what has been accomplished. Perfection in projection has not been achieved, irrespective of the splendid progress that has been made. Let all of us who are interested in the advancement of the science of motion picture projection rededicate our purposes to the continuance of the struggle for better projection, a struggle not rooted in selfishness; an effort not in the interest of personal gain, but a contribution to the motion picture industry through co-operation and good will.

Portable Mixing Booth

PORTABLE mixing rooms for big settings are a new development of talking motion pictures. Except that they are larger, they are identical with the sound-proof camera booths in structure and appearance. They can be moved from place to place on the sound stages or shifted from one stage to another.

The booths are mounted on pneumatic tires and can be moved to any desired spot on the sets. They are fronted with sound-proof glass windows similar to those of the camera booths. If he so desires, the director may enter the mixing booths and hear the voices of the players as the microphones hear them. At the same time he can be watching the action from a point as advantageous as his own directorial chair.

It is in the mixing room that the sound volume is controlled. The voices of the players and other sounds are caught by microphones and transmitted to these rooms where the mixer controls their volume, amplifying or reducing as may be required.

Paris—French musicians at a meeting here voted not to accept employment in sound or talking pictures except on their own terms.

Multicolor

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for his own black-and-white scene, and then shot my color right beside him. It was on an average-sized set, and I remember he used just 800 Amps. He was sure that I'd underexposed, so we made another shot of it with a 25% increase in light; then, just to convince him, I made another with 25% *less* than the original load. When we saw the three on the screen he was sold, for the first shot was perfect—just as well exposed as his own black-and-white shot made at the same time. The second shot was plainly over-lit, and the last was just a bit underexposed. That convinced him; he didn't try to find any more faults with Multicolor. I've kept trying myself, but I haven't found any: I've worked with it under about every sort of condition, too.

"In *The Great Gabbo*, though, we had only our earlier film, we worked right alongside the black-and-white cameras. At Fox's we've worked in Movietone, right close to the mike and people, with only one of their 'horseblankets' thrown over the camera —and no camera noise. I've worked in booths and out, with Inkies and Arcs, on studio stages and in the desert—and still I've had no trouble with Multicolor.

"I've had difficulties with some of the art-directors and executives, though. A lot of them are so eager to get the best results from their color photography that they overload their sets with color. It's a natural impulse, but one that doesn't work well in practical color work. Any excess of color contrast seems unnatural on the screen, for you will observe that nature's colors are never glaring. If these people would only remember that, and decorate their sets as quietly and tastefully as they would their own homes, we could give them much better results.

"Probably the greatest single thing about Multicolor is the fact that it needs no special cameras. Most cameramen are carrying individual investments from $5,000 to $10,000 in cameras and equipment—and an estimate of $500,000 for the total amount tied up in the industry's cameras is very conservative. Any innovation that will make it necessary to discard these expensive instruments is hardly a benefit to the industry, and certainly a blow to the individuals. Multicolor does not do this, for not only can Multicolor be shot in any existing camera, *but it can be shot without making any change which will in the least effect its value as a monochrome camera!* In fact, recently I went out to shoot part of a two-reel talking act in color, and after the color sequences were finished I shot the rest of the picture in black-and-white *with the same camera, untouched.*"

The present policy of Multicolor Films is to supply, for the present, the special magazines and films needed, with an expert color cinematographer to handle the photographic direction with respect to color. To this end they are training a corps of expert color cinematographers. In due time, however, as the knowledge of the peculiarities of color camerawork becomes more general, this latter service will become unnecessary, and Multicolor cinematography will take its place on perfect parity with today's accepted monochrome.

Sets for Home Movies

(Continued from Page 33)

walls well so they will neither fall down nor waver as you are photographing your action. Also, when setting up your camera be very careful to see that there is sufficient portion of the set outside the image seen in the finder. Otherwise you may discover braces or ropes or other props on your screen and the illusion will be spoiled.

After building one of these sets you will find that you can do many things with it and picture making will become a real delight as you see your results on the screen.

Exposure Problems

(Continued from Page 30)

filter. It is suggested that the subject of exposure without filters be mastered first and then no difficulty will be experienced when filters are used.

In no other phase of movie making is the old saying "practice makes perfect" true. Correct exposure is merely a matter of practice. Keep a record of the exposure given to your pictures and in a surprisingly short time you will find that you have mastered the subject of exposure.

Your Makeup Problems

By MAX FACTOR
[*Internationally Known Authority on Makeup*]

DEAR MR. FACTOR:—I am a brunette with brown eyes, dark hair and olive skin. Two weeks ago I blondined my hair, the result is that my make-up makes me look grotesque. What can I do?

L. P.,
San Diego, Calif.

ANSWER:—To avoid a clash in the color harmony of your make-up, I would suggest that you carry out a much lighter complexion with your make-up. Nature has its own scheme of giving the complexion a harmonizing combination of colors, and this is the standard by which our judgment is governed. Now that you are a blond I would advise you to use a natural shade of powder in preference to any lighter or darker shades. Blend a brown eye shadow over the lids and use a medium lip rouge, Blondeen dry rouge for the cheeks. This will give you the proper color harmony for your change.

MY DEAR MR. FACTOR:—I recently read in the Los Angeles Examiner an article which said that 47 per cent of the women in the United States were neither blondes, brunettes or redheads—that they were Brownettes. That interested me greatly as I am a brownette. I have grey eyes, brown hair and my skin is medium in color. Will you give me your idea of just what I should use to get an effective make-up.

M. C.,
Dayton, Ohio

ANSWER:—Use olive face powder, medium lip stick, grey eye shadow and raspberry dry rouge.

MY DEAR MR. FACTOR:—I am of Spanish extraction and while my hair is blue black and my eyes are very dark, my skin is light and creamy and not olive. You have heard of the Spanish girl of dark skin and blonde hair; I am just the reverse. Will you please tell me how I can overcome this peculiar color scheme and reconcile my complexion to my hair and eyes?

L. M.,
Detroit, Mich.

ANSWER:—I think that a very fair skin against a brunette background is rather attractive and if you use a natural powder it would not change your complexion any and harmonize with your own complexion. I would complete your make-up by using a brown eye shadow over the lids, a dark lip rouge and a raspberry dry rouge for the cheeks.

I am a red head and freckle easy. What can I do to do away with these freckles? Is there a foundation cream that will overcome the freckles so that my make-up can be put on over it all and eliminate them?

LAURA G.,
New Rochelle

ANSWER:—During my experience I have not found any freckle cream that would remove freckles entirely; however, I suggest that you use a powder foundation that will blend between the shade of your freckles and your natural skin. The powder foundation when properly applied will conceal the freckles effectively.

DEAR MR. FACTOR:—Do you design wigs to suit the wearer's personality? I am very blonde, which of course makes it difficult for me to wear all colors on the stage, successfully, and so I

(*Continued on Page 43*)

Douglas Shearer, A. S. C., Lists Sound-Projection Faults

IN ORDER to establish a criterion as to "noises" caused by faulty projection of sound-films, Douglas Shearer, A. S. C., Recording Engineer for Metro-Goldwyn-Mayer recently made an exhaustive demonstration for the members of the Academy Sound Classes. Single reels of two recent pictures, Joan Crawford's *Untamed* and Lawrence Tibbett's *Rogue Song*, were printed up with the deliberate idea that they were to be maltreated in every possible way. Further, the projection machine through which they were to be run was loosened in every manner which might cause extraneous sounds.

The result was an amazing series of unpleasant noises and other acoustic flaws which very well illustrated what can happen to a perfectly recorded picture if the projection is not equally perfect. Following the experiments, Mr. Shearer prepared the following chart of the noises due solely to bad projection.

Sprocket Noise—Caused when the film pulls over to the left in the projector, allowing the exciter lamp of the light-ray reproducing system to play through the sprocket holes of the film as well as the sound track. The noise is a rather high-pitched buzz, somewhat like a busy door-bell.

Flutter—This is a pulsation in the recorded tones. It sounds as if the speaker is gagging a bit over a mouthful of mush. It is caused by too long or too short loops in the projection machine, or loose pads on the track guiding the film. These things cause both picture and sound track to move in and out of focus.

Frame Noise—The opposite of sprocket trouble. Caused when the film is pulled in the machine too far to the right, running off the sound-track onto the picture itself, playing, so to speak, the picture and the dark spaces between the frames. Sounds like a motorboat at high speed.

Motorboating—Same as Frame Noise.

Overspeed—When the speed is suddenly increased beyond the normal of 90 ft. per min. (33 1-3 R.P.M. for discs), the high frequency sounds are emphasized at the expense of the lower ranges. In other words, the great basso, Chaliapin, would sound like a soprano under excessive overspeeding.

Underspeed—When the projector is suddenly slowed down the reverse of the above occurs. The lower frequencies are emphasized, and Galli-Curci would sound like Chaliapin.

Dirt Noise—Film should always be carefully cleaned after each running, but sometimes an operator is careless. When this happens, specks of dirt form on the sound track. These specks cause variations of sound which are manifested in many ways—squeaks, whistles, fire-cracker noises, etc.

Loose Exciter Lamp—When the exciting lamp of the light-ray sound reproducing system becomes loose there is a distortion of sound, making it hard to keep the attention concentrated.

Gear Noise—Noise recurring at regular intervals, dum-de-dum, etc., can usually be traced to loosened gears in the projector.

Blooping—This is a sudden "plop", usually caused by a bad splice between sections of the film. This can always be avoided by correct splicing, and properly blocking out the spliced patch in the sound track.

Insulation Noise—Some theatres have not yet installed the heavier tripods and insulation pads required for sound reproduction. The amplifying tubes and the photo-electric cell are very sensitive to jar. Sudden "whack" noises from the screen are generally traceable to trouble caused by vibrations when the projectionist walks across a booth in which the insulation has been badly done.

There are other noises which can be caused by accidents and by faulty handling of the equipment, but these are the major extraneous sounds which annoy theatre-goers. All of these sounds can be eradicated. Sound reproduction is a carefully developed science and variations from perfection seldom come from any reasons except human carelessness. When a sound picture leaves the studio, it is as perfect an example of fine recording as the skill and care of the production personnel can make it: if it is properly cared for and carefully projected it should also give perfect reproduction.

Richmond Public Schools to Continue Educationals

Richmond, Va.—Educational films are to be shown in the public schools of Richmond throughout the remainder of the 1929-1930 session, it is announced at the office of Albert H. Hill, superintendent. "Meat From Hoof to Market" and "America's Granary" are the titles of the pictures shown recently. Motion pictures are also show nin many other schools in Virginia. Radios are also being used to aid educational work in the state.

Multiple Exposure

(Continued from Page 4)

For the disc system, lap-dissolves still present a serious problem. Maintaining proper synchrony is difficult, and it is highly improbable that the two scenes could be recorded directly over each other successfully. Therefore the general practice of organizations using disc recording exclusively is to make all lap-dissolves and fades with the optical printer. However, where the equipment permits, the most likely way to secure these effects without the use of 'dupes' is through the use of a film-recording process, and subsequent re-recording onto the disc. Another possibility is the use of two separate discs: the first being used until the fade-out is complete—the volume being reduced electrically—and the second being used with the second scene of the pair; the photographic film having been rewound to the original starting-point of the first scene, after which it is run, with the shutter closed, synchronously with the new record, to the point at which the second half of the lap begins, whereupon both picture and sound are faded in, and the scene continued as usual. The two partial records can then be processed, and re-recorded onto a third and final one. A third possible method is quite similar as regards the making of the first record. This is then processsed, and played through a loudspeaker on the set, while the camera runs, with shutter closed, synchronously with the record, which is being re-recorded by properly placed microphones. At the proper place, the camera shutter may be opened, and the other microphones about the set gradually energized to record the action of the second scene.

A variant of this method has been used in the recording of large scenes, especially those representing theatrical performances. The vocal part of the scene is first recorded, under acoustically perfect conditions. The film or disc of this record is then processed, and thereafter played through a loudspeaker and re-recorded while the photographic part of the scene is made, the actors 'mouthing' their lines and songs inaudibly. This combination enables these somewhat difficult scenes to be photographed and recorded much more satisfactorily than could otherwise be the case.

Similarly, in a recent film wherein the star was required to play a dual role, this arrangement enabled him to time his actions perfectly, and to give himself his own cues. Photographically, the scene was made by the familiar 'split-screen' methods, whereby the picture-area is divided in two, first one half being photographed, and then the other. Strangely enough, the addition of dialog simplified the procedure, instead of complicating it. Formerly, the action had to be timed by counts, which, for any degree of precision, was rather involved and exacting—and at times highly disconcerting to temperamental players. In this case, however, the actor was able to time and cue himself. The first half of the action was photographed and recorded quite normally. Then the sound record—in this instance a disc—was quickly processed, and the photographic film turned back to the original starting-point. When the record was ready, it was played through a loudspeaker on the set, before which a microphone was hung. Both the camera and recorder were synchronized with the phonograph, and the remaining half of the scene was made with the phonograph not only supplying the cues to the actor, but also making the dialog complete on one record for both halves of the scene.

Similar double-exposure work has been done in at least two instances in the Variable Density process, using both light-valve and glow-lamp recording. In the first case, the scene was comparatively simple, requiring one character to converse with another, played by the same actor, without a great deal of action. Photographically, of course, it was easy, the more so since one character remained practically motionless throughout the scene, presenting his profile to the camera. The sound was not difficult, either. Between the speeches of the first character, the sound-track was left blank, by closing the lens of the recording light. This first record was then processed, and played back to the actor as a cue for his speeches in his second character. However, instead of using a loudspeaker and re-recording, the actor wore a radio earphone on the side away from the camera, and the two partial records were combined later, in the printing.

In the other case, where the glow-lamp method was used, the two halves of the scene were made in quick succession, with a single sound-track. To avoid exposing the film between each character's speeches, the lamp was withdrawn, and replaced at the proper time. As there was no partial record to play back to cue the actor, and as counts were obviously impossible, the cinematographer memorized the entire scene, and devised an elaborate system of lights by which he could signal both actor and recorder their respective cues. In this case again, he had to take into account the lag in their response. Aside from this, his task was of particular interest because of the nature of one of the doubled scenes, in which the actor, having beaten himself in a fight, knelt over his own prostrate form, and talked with himself. The effect was achieved by exact and skillful photographic matching of the actor's head onto a double's body. The scene was photographed and recorded three times—and each 'take' was perfect!

So far as is known, while such double-exposure work is equally feasible with the Variable Area systems, none has so far been attempted, as no need for it has happened to arise in the course of the regular work of the studios using that system.

Thus, however, it will be seen that even in the brief space of a year, studio technicians have so far mastered the sound device that they can successfully attempt most of the cinematic effects and tricks of yesteryear in today's vocal films. Had they achieved this under the perfect conditions of laboratory research, they would be deserving of the highest praise, but that they have done so instead under the hurried and nerve-wracking conditions of scheduled commercial production adds incalculably to the glory of their achievement.

Producers and Technicians Join to Solve Picture Problems

A CLEARING house for technical information and research among the Hollywood studios has been set up in the Academy, it was also announced, through a joint committee of producers and technicians which is sponsoring co-operative studio effort on non-competitive subjects. The committee is headed by Irving G. Thalberg and includes M. C. Levee. William Sistrom, Sol Wurtzel, Walter Stern, H. Keith Weeks. Fred W. Beetson, J. T. Reed, Nugent H. Slaughter, J. A. Ball, Gerald F. Rackett, and F. E. Pelton.

Tests and classification of the best materials for sound picture sets, an improved cover to silence the camera, and investigation toward a silent arc light are the first projects undertaken by the committee.

"The need has been growing for a clearing house of information to benefit the whole production industry," committee chairman Thalberg stated. "Studios have all been meeting approximately the same problems in connection with sound pictures. They have been struggling with them individually, duplicating the expense and effort of research. This committee, through the Academy, will sponsor the collection and dissemination of information on technical progress made in different studios that has general application. This is apart from production competition, as competition among studios is properly on the basis of quality of product and not on making more expensive the general tools that all use."

Academy committees are working out a standard for release prints to improve projection in theatres and are studying variation in screen illumination. A recommended practice for correlation of camera and projector apertures was recently adopted by all the studios.

When the microphone first came to Hollywood picture stages the cameras were locked into cumbersome soundproof booths. Smaller individual hoods, "blimps," and "bungalows" have gradually superseded the original "iceboxes," but the most efficient way of keeping the camera noise from the microphone and at the same time restoring the camera's mobility has yet to be devised. The Academy's joint Producers-Technicians committee will sponsor development of a better cover for the camera to be used in all the studios.

Construction of sets from materials which will photograph well and not distort sound has been a major studio problem. Data is now being collected by the Academy on behalf of the committee. The Bell Telephone Company Acoustic Laboratory will collaborate in making tests to provide a wider range of materials suitable for set construction.

Television Coming

WITH the strides being made and in prospect, television should be pretty well perfected in 25 years, Elmer E. Bucher, executive vice president of RCA-Photophone, recently told the New York Co-operative Club. The combination of talkers, radio and television in the home is not far off, despite the fact that television is not yet well developed, he said. A great number of engineers now are devoting time to television, Bucher declared.

Color in Films Will Improve Feminine Dress

THE advent of color in motion pictures promises to make more tasteful dressers of America's women, according to H. M. K. Smith, costume and color expert of Paramount. He asserts that while even in the smaller towns our women, thanks to the influence of films, are today just as well dressed as those in the cities, they are still found lacking in "a practicable appreciation in color. This the motion picture is now certain to teach them, for the color wave is coming just as definitely as the sound wave came a year ago," he adds.

$2,500,000,000

(Continued from Page 14)

last six weeks, producing companies have rewritten 3,800 contracts with small independent exhibitors, who bid more than they could afford for sound pictures, the revision amounting to a cash refund of $1,300,000.

"Scientists of repute are now agreed that the American motion picture is a positive and vigorous deterrent to crime.

"The industry contacts with more than sixty religious, civic and educational organizations; we send to a studio relations committee all thoughtful and specific comment on pictures, and we make available previewing facilities to representatives of responsible public groups."

Progress In Studio Illumination During 1929

By Elmer C. Richardson

WITH the closing of the year it is of interest to note the progress made in the field of incandescent lighting in the studios. This type of lighting has been in use on a production basis approximately three years. At the time it was introduced the sound pictures were just entering the production stage, with only one studio actually operating in that field.

While the use of "inkies" was well under way in the last year of silent picture production, their use received a tremendous impetus when the studios began to make the "talkies." There were several factors contributary to this: Pan-chromatic stock became almost universally used for negative film, and with this stock the "inkies" were required for good separation of the color values. The quiet operation of the incandescent equipment simplified the whole problem of using the microphone, and they were lifesavers to the producers, who at that time had plenty of troubles on their hands without considering lighting problems. Fortunately, the first cost of equipping the studios with the new lighting system was only a fraction of the cost for equivalent arc equipment. The "inkies" offer so many advantages that today the majority of sound studios have adopted the new type of lighting.

The manufacturers of Studio Lighting Equipment have been "upon their toes" and as the needs for particular types of lamps have developed they have been quickly supplied. Today, Mole-Richardson, Incorporated, the pioneers in this type of equipment, are able to supply a complete line of "inkie" equipment which fills practically every studio demand.

A year ago the sets used in sound pictures were small and at that time very few powerful globes of 5,000 and 10,000 watts were in use. For back lighting the MR-Type 200, 18" Sun Spots were most commonly used. The year 1929 opened with a "bang." Numerous producers began to enlarge their sets. Full stages were occupied with single sets filling the entire space. The use of MR-Type 224, 24" Sun Spots in quantities such as two hundred, three hundred, and even up to five hundred has become common practice in lighting these large productions.

For the colored motion picture the "inkies" have been a boon. The light they furnish is of constant value and the beauty of the color reproduction obtained with incandescent lighting has started an insistant demand on the part of the theatre patrons for the magnificent form of entertainment which the colored motion pictures afford.

The actual per cent of the cost of producing sound motion pictures which is chargeable to the lighting, is relatively small as compared with the other production costs. Savings made in current consumption, the cost of either carbons or mazda globes, the first cost of equipment for either arc or incandescent illumination, or the actual labor cost of rigging and shooting; are not the most important economic factors, although in such costs the "inkies" show that considerable savings are possible. The important items to consider are: The quality of the photography produced; the effect of the lighting system upon the sound recording; the economic saving made possible by allowing the directors, actors, cinematographers, and auxiliary workers to function without the interruptions resulting from faulty operation of the lighting equipment. In meeting these qualifications the "inkies" have given a good account of themselves.

The work of camera men who have photographed using filament lamps for illumination has received the highest praise from exhibitors, critics, and the general public. Indeed, never has the public had such offerings as were available at the opening of the exhibitors' season this fall.

Sound recording, aided by lack of extraneous noise, has achieved a tremendous advance over the recording of a year ago.

Directors have been able to extend their "takes." Now the limitation is the capacity of the camera magazine, rather than with the short period of time during which the arc lamps would operate before flickering or blinking interrupted the shooting.

Of course no one would say that all of these advances are creditable to the use of incandescent lighting. Much credit is due to the makers of pan-chromatic filament stock, to the development of cameras especially suited for use in making the sound pictures, to progress in laboratory practice, many vital improvements in the recording systems, detail attention to improvements in make-up, and to progress in the operation of the entire sound equipment. These factors have contributed greatly to the production of the finest entertainment ever offered to the public for their admission fee.

The problem of 1930 is to make the progress in the coming year overshadow that of 1929. Technical departments all throughout the industry will rise to the occasion and *deliver*.

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All Wide Film and All Color Predicted

TALKING pictures in colors will crowd black and white films off the screen. Double width films on a screen that fills the proscenium arch is the entertainment outlook for the near future. The stage itself will not be eliminated, but will be aided by pictures. These predictions form the basis of comments made by Jesse L. Lasky, vice-president in charge of production for Paramount, as the result of a survey of the field made at the end of the first year during which all-talking pictures have been solidly established.

"The public likes to see color instead of the black and white," he declared. "Technicolor has so improved its process that there is no such thing a eye-strain any more and added progress is being made daily.

"The production and presentation of musical plays on the screen cry for color. I might offer as an example our current Technicolor picture, 'The Vagabond King.' In this, color is used to heighten dramatic moments and to put the audience in the spirit of the lighter scenes. Color has a genuine dramatic value, and the use of it dramatically is the first principle of showmanship. For instance, black is impressive for a sombre scene and high tones are vital to happy scenes.

"Color," he pointed out, "ties it with the enlarged screen, giving spectacular effects never before attainable with pictures. Experiments are now being conducted by Paramount for the further use of the large screen, adding that this company was the first to present the double-width film on the full-stage silversheet when 'Over the Top' was offered recently in New York.

"With the enlarged screen," Lasky said, "will be double-width film. This combination of photography and projection presents a very beautiful and distinctive quality, and a stereoscopic effect.

"The magnascope was the first step. That simply was a lens that magnified the ordinary picture and was used in certain localities for the showing of 'Old Ironsides' and 'Wings.' The new process, the magna-film, takes a photographic negative twice as wide as the standard negative, bringing everything into comparative close-up."

"With the arrival of talking pictures," Lasky continued, "the spirit of adventure has taken hold of the screen industry. Every unit is developing the mechanical possibilities to the last degree, and the next ten years will be years of advancement and progress far beyond our dreams. This spirit will extend itself to the speaking stage for I believe that the talking screen will reach out and stimulate that.

"Eventually," he said, "the dramatic stage will be subsidized by the motion picture industry. Certain dire predictions that the stage will disappear as the result of the coming of sound to the screen are wrong. The stage will remain because the public wants it. This is fortunate, for it will be a training ground and proving field for the sound films of the future."

Another current change which he noted was the change in the public attitude from mad jazz to more sedate syncopation.

"The jazz age has ended," he said. "We are going into frank age, the normal change that always comes in everything, whether it is music, literature, plays or pictures."

Technicolor for Europe

DR. HERBERT T. KALMUS, president of Technicolor, accompanied by Mrs. Kalmus, have gone to Europe to complete negotiations for construction of plants in England and on the continent. The first laboratory is expected to be built in or near London, and the second in Germany, probably Berlin. After a sojourn in London, Dr. and Mrs. Kalmus will visit France, Germany and Italy.

Make-Up Problems

(Continued from Page 37)

have considered having a dark wig if I could get one which looked like it belonged to me. Also, could you do this from a photograph? V. M.

ANSWER:—We want to advise you that we create and design wigs for every personality known to the stage and screen. This cannot be done successfully from a photograph. Hair, in order to appear like it is part of you must be in harmony with the lines of your contour—your head must be measured very carefully so that the wig will be shaped correctly. Also the color must be in harmony with your complexion.

Silent Pictures to Remain

THERE will always be room for clever silent pictures, with stories that stimulate the imagination," declares Col. E. A. Schiller, vice president and general manager of Loew's Inc. "Silent pictures will draw patronage on even terms with talkers when they have stars of comparable popularity with those of the audible films with which they may be competing," he continued.

Machine for Cutting Records

(Continued from Page 8)

relative response of the recorder when measured at the end of the stylus arm and when measured at the monitoring coil position are practically identical.

6-A Playback Reproducer

The 6-A playback reproducer is a device for playing back from wax engravings for purposes of inspection and observation as to the perfection of the work. It is not intended that the engraving so used shall be preserved for making of finished records, although this has been done at various times with reasonably satisfactory results.

The transmission characteristics of the 6-A reproducer have been described in literature previously referred to, but no detailed description of the device has been given. Briefly, it may be described as a balanced armature electromagnet device in which an armature, mounted on a steel diaphragm, is free to rock about a diameter as a pivot, under the influence of the needle-driving member. Wings extend laterally from the amature in such a way as to prevent the diaphragm assembly from moving in the characteristic diaphragm or piston manner. A motion of the armature in the magnetic field causes the induction of a voltage in the windings surrounding the inner pole tips, which induction is proportional to the velocity of the armature and is the sole function of the reproducer device. One of the features of the A-6 reproducer is the oil damping, provided to prevent the armature velocity and the needle point impedance* from rising to relatively large values for frequencies at, or near resonance.

From a transmission point of view, there are two important considerations that must be met in order that the playback reproducer may be considered satisfactory. These are: first, that the device shall be capable of tracking the wax groove without destroying it to the extent that the reproduced sound do not faithfully represent the recorded material; and second, that the voltage, developed by the device, shall be proportional to the velocity of the record groove for all frequencies of interest.

The 6-A reproducer may be considered as a structure analoguos to an electrical circuit of the form shown in Fig. 8 to which a constant current is supplied by the record groove. Assuming that the various constants in the figure are the equivalent values measured at the needle point, the two conditions above may be stated mathematically as follows:

$$\frac{vm}{v} = \frac{S}{(S+S_d-w^2m)+jRw} = \frac{1}{C} \qquad (2)$$

$$Z^* = S\frac{[(w^2m-S_d)-jRw^1}{Rw^2+jww^2m-(S+S_d)} < \frac{EA}{v} \qquad (3)$$

Where E is the maximum permissible stress of the wax, A is the area of the bearing surface of the needle in the groove and C is a constant. Assuming that for any frequency of interest S is greater that w^2m, it is obvious from equation (2) that will be maximum when Sd is negligibly small in comparison with S.

It is of course impossible in a structure of the type shown, to satisfy equation (2) to the extent of making C absolutely constant; but for some limiting value of C, it can be shown on the above basis that the natural frequency of the device when critically damped is

$$f_o = \frac{\sqrt{\frac{S}{m}}}{2\pi} \sqrt{C-1} \qquad (4)$$

It can be shown that the response of a structure as shown on Fig. 10 will decrease rapidly after the natural frequency is past, and therefore, that the natural frequency should be at, or near, the upper limiting frequency of interest. It will also be clear (from equation (4)) that S should be made as large and m as small as possible.

From Fig. 8 it is evident that in S, only the needle stiffness component (S_n) is under the control of the instrument designer, or that the value of S may vary throughout wide limits, depending upon the stiffness characteristic of the record material. That the stiffness of the needle used in the 6-A reproducer is large, in comparison with the stiffness of the wax, is indicated by data to the effect that the resonant frequency of the device on hard records is about four times as great as on wages. It is therefore quite probable that the factor S in equation (4) is about as large as it can readily be made.

The alternate method of obtaining a high natural frequency by reducing m to a minimum can be accomplished in either of two ways: by actually reducing the amount of material used, or by disposing the material in such a manner as to offer a minimum impedance to motion of the needle point. In regard to the amount of material used, needle of the 6-A reproducer is a hollow conital structure, the walls of which are about .002" thick, while the iron use din the vibrating system has been reduced to the minimum require dto carry the flux. Further reduction in the needle wall thickness would probably be impractical, and further reduction in the amount of iron would necessitate a corresponding reduction in the output voltage or would result in an impure voltage wave. As to disposition of materials, the driving needle has been designed as an impedance stepdown transformer of such a ratio that efforts to further increase the ratio are not successful on account of the increased amount of needle material required. The mass of the diaphragm an darmature contribute only a small per cent of the total impedance effective at the point.

So far as mechanical impedance of the reproducer is concerned, there probably is a considerable variation in the elasticity of waxes available at the present time, and the only safe procedure is to make Z equation (3) as small as possible. For the condition set up for equation (4) the needle point impedance for different frequencies may be expressed as

$$Z_{min.}\, f = \sqrt{mS} + j^{w}{}_{m} \qquad (5)$$

$$Z_o - \tfrac{1}{2}\sqrt{mS} - j\frac{S}{O_w} \qquad (6)$$

Where Z min. f refers to the impedance at minimum frequency of interest and Z, is the impedance at the natural frequency, which as brought out should be the impedance at or near the maximum frequency of interest. It will be obvious from these equations that the impedance approaches the limiting values of 2VmS and $^1/_2$ VmS as the two limiting frequencies are approached. It is therefore clear that reduction of m in order to increase the width of the response band is also effective in reducing the impedance of the vibrating system. From equations (5) and (6), and certain mass and stiffness data available, it appears that the impedance of the 6-A reproducer, throughout the band of frequencies of interest, might be as great as 1200 dynes sec./cm., which for a velocity of 4 cm./sec. is equivalent to a lateral force of approximately 5 grams against the wax walls. It is of interest to note that the effective weight of the reproducer on the bottom of the groove should be of the order of 5 to 15 grams in order to obtain satisfactory tracking, and that for this weight the bearing surfaces of the needle in the groove are such that the ratio of lateral pressure to vertical pressure may vary between limits of 1 and 5 depending on the setup. It is to be expected therefore that any trouble of tearing the wax is probably due to excessive lateral pressure. For this reason, it might be desirable to cut the playback waxes at a somewhat lower level than the waxes that are to be used for pressings. This would also reduce the required weight on the bottom of the groove. With waxes cut at normal recording levels, however, we have found it possible to obtain satisfactory tracking with a weight on the needle point of as little as 5 grams, and with such a setup it is possible to play a wax several times without a noticeable change in quality or noise.

In connection with the question as to the proper effective weight of the reproducer on the bottom of the groove, may we call attention to the method by which the weights used were determined. It consists in balancing the device so that the needle point just barely clears the surface of the wax, after which, a weight of the proper amount is placed on the reproducer directly above the needle. The scheme is reliable and convenient and we see no reason why it should not be used in the recording field.

New Disc Adopted by Watson Television Device

At the suggestion of P. F. Pfeil, of Graf lens division of the QRS-DeVry Corp., a new and improved television disc has been adopted by Albert H. Watson in his television apparatus. The disc, which reflects the image to the audience, as originally designed by Watson, requires 48 concave mirrors, each separately adjusted and attached by three screws. The individual adjusting of the 48 mirrors was accomplished by forcing the mirror on a slitted edge of the disc, suggested by Pfeil, down into a cam arrangement below, thus automatically giving the necessary increased tilt to each of the successive mirrors.

Talking for Pictures

(Continued from Page 13)

educational character. Of necessity, the films must have enough action to carry it without the excessive use of sub-titles, otherwise, the audience tends to lose interest with the result that more harm than good is achieved. The films are shown during meetings of organizations, women's clubs, school clubs and assemblies, and whenever requested by persons residing in the Los Angeles County health department territory.

The most significant limitation to progress with the use of silent films is the amount the public will "take." If health education is desired by the people, they feel it can be obtained from books, instead of incomplete titles hurriedly read from the screen.

The advent of talkies in public health has more than trebled the value of the use of motion pictures and has increased its scope by more than sevenfold. Almost every one of the scores of phases of health can be recorded on film and projected at will with little initial expense in comparison to the costs of securing high salaried physicians, surgeons, and specialists to speak at lectures and meetings. Indirect instruction may be gained in personal hygiene; the early detection of disease or physical defects; prevention of lowered physical resistance; the maintenance of balanced diets; proper sanitation; prenatal, infant, child, and maternal hygiene; food and drug laws; industrial hygiene; nursing care; and many other subjects which, generally, are little known except among skilled technicians.

The extreme value of health education has been recognized by national and international authorities as tremendous savings in terms of dollars and the prevention of suffering and poverty. Figures compiled by United States Surgeon General Hugh Cumming show that there are at all times in the United States more than one million persons incapacitated by illness, most of which is preventable. The economic loss from this situation is estimated to be over one billion dollars when the cost of medical care and the loss of earning capacity is computed. The application of modern public health and an adequate health education progress throughout the United States would cost only one-fifth of this amount—twenty million dollars a year, with constantly decreasing cost of maintenance with time and with increasing value obtained. Approximately 70 percent of the school children in the United States are handicapped by physical defects, many of which are unsuspected and remediable. When the cost of consequent impaired efficiency of the school system of the nation is computed, it is found that many more thousands of dollars are wasted each year.

More than 50 percent of the population of the United States reside in rural districts or communities. This means that sixty millions of people living in outlying or remote areas must be reached by a health educational program which is inexpensively mobile.

Audiocinematography will do this. Many of the theatres in suburban districts and agricultural areas have followed directly in the footsteps of large cities by installing workable sound equipment with daily change of program. A short "fill-in" topic relating to public health would serve very well as an effort to save part of the billion dollars wasted annually on illness and suffering.

This medium will reach the class of persons who most need this service. Too many others still believe that their children are "just naturally skinny" and "they just must have the children's diseases". Too many fail to utilize medical science soon enough to accomplish much good.

The child need not suffer from smallpox, diphtheria, typhoid fever, tuberculosis, and many other infectious diseases if parents will take advantage of the means of prevention. They must be informed that there are organized health departments under competent supervision which can be of definite aid to them from a standpoint of economy and humanity. They must learn of the services offered, of the illnesses preventable, and the efficiency of public health will be advanced to a considerably higher degree.

New Du Pont Film

"HYDROELECTRIC Power Production in the New South," the third of a series of engineering motion picture films, has recently been released by the Du Pont Company. It is a two-reel film showing the development of the hydroelectric project of the Carolina Power & Light Company in the Great Smoky Mountains of North Carolina.

It will be loaned, free of charge, in 35 or 16-millimeter size by the Motion Picture Bureau, E. I. Du Pont de Nemours & Company, Inc., Wilmington, Delaware.

Pacific Coast Section, S. M. P. E., Plans Impressive Program

THAT the Pacific Coast section of the Society of Motion Picture Engineers, now numbering 73 members, will be an active factor in the motion picture industry on the California coast is indicated by the impressive program just announced by Chairman Peter Mole and Secretary-Treasurer G. F. Rackett.

An outstanding feature of the work planned is the desire and aim of the organization to meet the problems of the future and not wait until they are here. "We feel," say Mole and Rackett, "that our purpose should be to anticipate the problems of the future and be ready for them when they arrive."

The program for the year ahead deals with the following subjects as outlined in the society's announcement:

The scientific fundamentals of color.

The application of color to cinematographic photography with particular reference to those systems in most current use.

Further discussions and specifications on wide film.

The analysis of the function, operation and equipment of film laboratories with particular reference to the changes in operation and control occasioned by the commercial processing of 35mm sound film and the possible processing of sound film wider than 35mm.

The general subject of television is to be covered both from the standpoint of fundamentals and technical operation and its application and possible effect on the motion picture industry.

The much misunderstood subject of stereoscopic depth is to be gone into for the purpose of establishing what it really is—what has been done in the field of development—and the scientific limitations of future progress.

The meetings throughout the year covering the above program will be held at places suitable to the particular program and paper being presented.

Germany Leads the World in "Film Surgery"

GERMAN surgeons and physicians are far advanced in the use of motion pictures for medical educational purposes, according to Dr. Joseph B. De Lee, of the Chicago Lying-In Hospital. Dr. De Lee recently sailed on the Cunard Liner *Berengaria* to study German Medical Film Laboratory customs.

In sailing, Dr. De Lee said, "Motion pictures as an aid to physicians is not new in America but the Americans are not so far advanced as the Germans. The Germans have been using motion pictures for educational purposes for a long time, but Americans have been slow to wake up to the advantages of motion pictures in medicine. Now they are beginning to awaken and are rushing ahead.

"I have been using motion pictures for educational instruction in Northwestern University as well as in the hospital for a number of years, and now I have a complete laboratory of my own where I have my own photographer take pictures while I am making an operation."

Dr. De Lee's film laboratory is perhaps the most elaborately equipped plant of its kind and for its purpose in this country at the present time. He has two Bell & Howell Standard 35 mm. professional cameras, two 16 mm. Bell & Howell FILMOS, and a complete assortment of lenses for these cameras, as well as a very elaborately equipped laboratory for photographing animated model work and drawings, and a remarkable photographic lighting plant.

In the new Chicago Lying-In Hospital, which is now under construction, there will be another complete movie laboratory which Dr. De Lee is confident will greatly increase the hospital's efficiency as well as be a great aid in the development of medical science generally.

The Technical Service Division of the Bell & Howell Company has been co-operating with Dr. De Lee in every way possible so that new developments in the motion picture industry may be placed at his disposal. He will spend two months in England, France and Germany.

(Courtesy of Filmo Topics)

Stage Technique in Talkies

(Continued from Page 16)

higher frequencies a desirable pressure doubling occurs before the diaphragm when the instrument is in free air, whereas when it is near a large surface the low notes are similarly reinforced and the advantage of the high tones is lost. And of course chamber resonances usually favor the lower part of the range, which is desirable in musical pick-up but can be well dispensed with in speech reproduction.

When the exigencies of pick-up compel the resourceful sound expert to place a microphone in such a position—and this applies to prop pick-ups frequently enough to be worth noting—he attempts to simulate a free-air pick-up by resorting to electrical filters. Fig. 3 shows an example of this device. Here the 500-ohm output of a microphone is connected to an amplifier input which matches its impedance. Between the two a 0.25 henry choke, controlled by a resistance in series, has been connected. The coil has a reactance of about 150 ohms at 100 cycles, 1,500 ohms at 1,000 cycles, etc. Obviously any tubbiness in the output of the microphone, caused by unfavorable acoustic conditions in the pick-up, may be remedied, at least partially, by adjusting the resistance to a suitable value. With all the resistance out, practically everything below 100 cycles is eliminated, with considerable effect up to about 600 cycles. With all the resistance in, the effect of the shunt is negligible. Alternatively, the inductance alone, with its internal resistance, may be changed to secure the desired effect.

The sound engineer worth the name does a good many things like that with his inductances, capacities, resistances, and other gadgets. What with these toys, and his job of educating the directors and producers and, equally, being educated himself, he is kept busy. Sometimes he is not only busy, but unhappy. But he isn't bored.

New Swiss Company

Washington.—The Standard-Cine-Phono A-G. of Zurich has been incorporated in Switzerland, it is learned from the M. P. Division of the Department of Commerce. The new firm will deal in films, projection apparatus and sound equipment. Offices are in Zurich.

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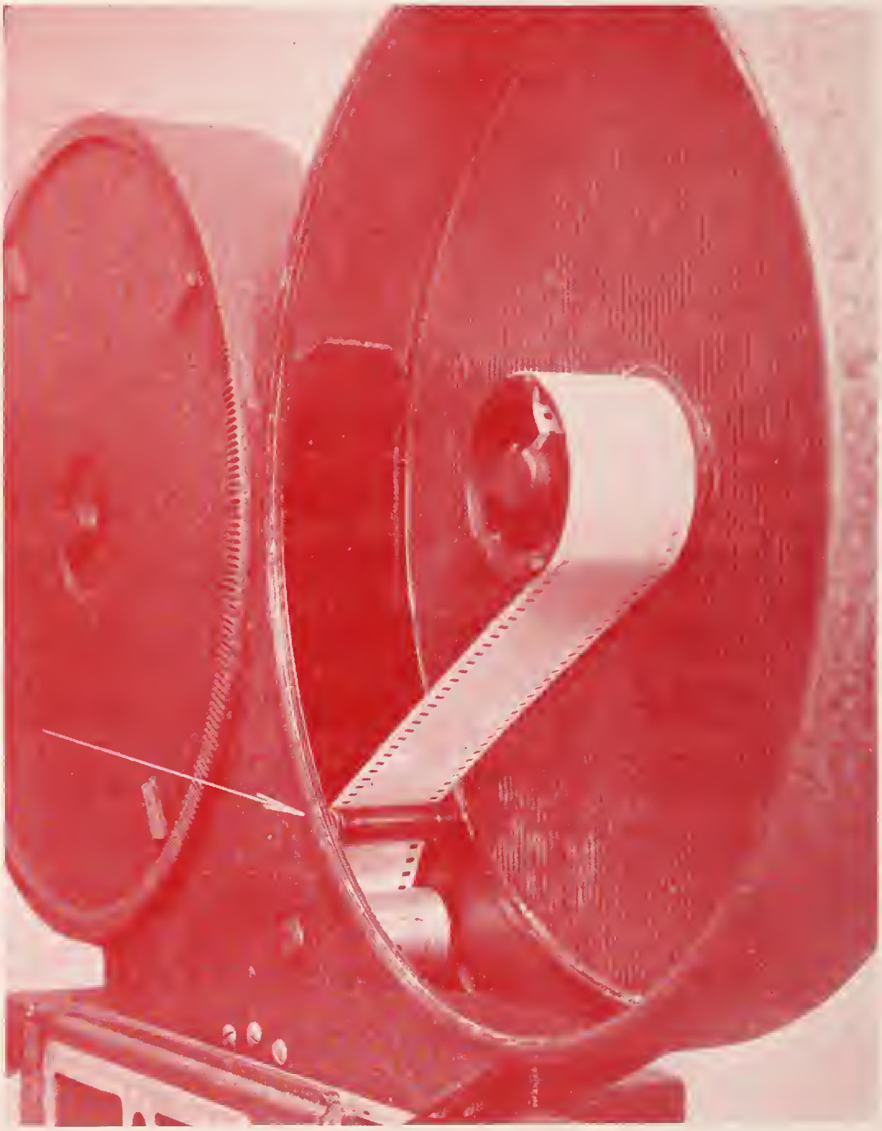

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